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AUTOMOTIVE and Uviation INDUSTRIES

MAY 1, 1944

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SYMBOLS

OF A "PROPER" NAME

The ingenuity and resourcefulness that has originated so many novel and precedent-breaking ball bearings is aptly described by the name NEW DEPARTURE » » Ball Bearings — the type selected for countless applications in this highly mechanized war—produced by NEW DEPARTURE in maximum quantity and top precision quality, will again be logical choice for peacetime uses.

NEW DEPARTURE

BALL BEARINGS

Standard Coded Lubrication Service

... a definite answer to your oilers' question, "Which lubricant to use?"

The best lubricants and the most careful study of where and how to apply them are wasted unless the *right* lubricant is applied to the *right* spot every time it is needed. Worse than that, when lubricants are misapplied, machines may be damaged, time is wasted repairing them, and production drops off. The men in charge of your lubrication can tell you how troublesome this problem is in your plant—particularly today with new men on machines and oiler crews changing continually.

Misapplied lubricants have been as much of a problem to us as to you. For example, our Engineers may work with your plant men to determine the right lubricant for a certain troublesome application. It is found and works successfully for some time. Then trouble suddenly occurs—bearings go out, and a machine is tied up. Perhaps a new oiler was on the job—his instructions might not have been clear—or some-

one just "forgot" and the wrong lubricant was applied. But before the real cause is discovered—if it ever is—our lubricant is subjected to criticism and you waste time needlessly trying to find another.

Standard Coded Lubrication Service is our contribution towards solving your problem and ours.

The plan is briefly described at the right. Any plant is free to use this system or adapt it to its lubrication program. Plants in the Middle West, whether they use Standard Oil products exclusively or not, can get the materials needed, and the help of a Standard Lubrication Engineer in installing the service. Call the nearest Standard Oil Company (Indiana) office. Say you want to get more information about Standard Coded Lubrication Service. Or write 910 S. Michigan Ave., Chicago 80, Ill. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

How Standard Coded Lubrication Service works

The first step in the plan is to assign code numbers to each lubricant used in the plant. Lubricants are simply numbered 1, 2, 3, etc. These numbers bear no significance as to type or grade of lubricant.

Next, numbered decalcomanias (furnished by us) are applied to:



-every point of lubrication on every machine

 every grease gun or oil can used in servicing equipment



-every container or drum on your lubrication carts where they are used

and every barrel, drum, or storage tank in your oil house.



You can see at a glance that oilers merely need to follow the code number when filling dispensing equipment from storage, and in applying the lubricant to the right place, which is clearly marked to show that lubrication is needed and what number to use.

Machine Record Cards:



Where desired, a supply of machine record cards is provided. The card or a copy of it may be kept in office files. This card shows the number of points to be lubricated, lubricants to

be used, and lubricating schedules.

Lubrication Chart: For control purposes, a card is provided to list, by brand name and code numbers, all lubricants used in the plant. This card is used by stock clerk

or stockkeeper to enable him to requisition products by brand name, and to mark barrels with the correct code numbered decal.



This Booklet gives full details of how Standard Coded Lubrication Service can go to work in your plant. Ask your Standard Oil Man for a copy. Talk it over with him and the men in charge of your lubrication. See how this plan fills

a gap in your lubrication program.

Oil is Ammunition . . . Use it Wisely

STANDARD OIL COMPANY (INDIANA)

STANDARD SERVICE

* LUBRICATION ENGINEERING

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to fit the space you have available, individually engineered to meet those special conditions. We'll gladly send our illustrated brochure, or answer questions. Write or phone to-day!

COTTA TRANSMISSION CORP., ROCKFORD, ILLINOIS



May 1, 1944

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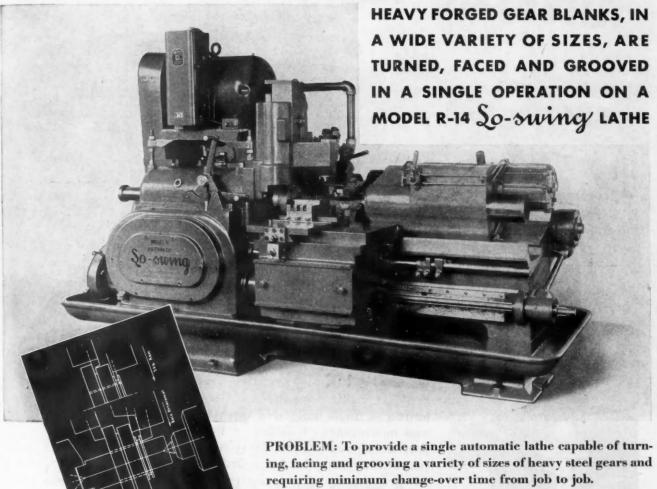


TEXACO CUTTING, SOLUBLE AND HYDRAULIC OILS MACHINING

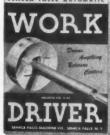
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PREPARED BY THE SENECA FALLS MACHINE CO. "THE So-owing PEOPLE" SENECA FALLS, NEW YORK



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Falls, N. Y.

ing, facing and grooving a variety of sizes of heavy steel gears and

SOLUTION: The R-14 Lo-swing Lathe was chosen for this job primarily because it had the power and capacity necessary to handle heavy steel gears, varying in size from 4¾" to approximately 10" diameter. The built-in, Quick Change-over Mechanism on this lathe also provided a simple and speedy means for varying the carriage stroke, as required for each individual gear job.

Forged gear blanks come to the lathe with only the hole finished. Drive is by arbor through this hole as seen in the drawing above which illustrates typical tooling for one of the gears.

In order to simplify tooling, this Model R-14 Lo-swing was equipped with a standard Third Slide or Overarm which carries the grooving tools. Turning is accomplished with the Front Carriage tools while tools on the Back Attachment face the sides of the gears.

E NEWS from SENECA FALLS

May 1, 1944

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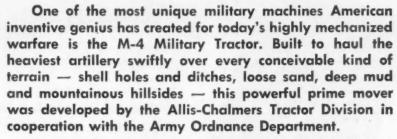
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AIR CLEANERS * METAL STAMPINGS * HIGH PRESSURE HOSE CLAMPS * IGNITION SWITCHES * ROLLED SHAPES * DOVETAILS



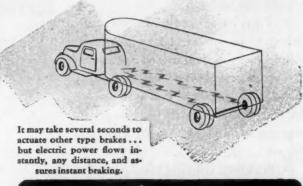
Positive Control — Driver has complete control at all times. Any degree of braking power may be applied instantly, without effort. A rheostat in the controller regulates flow of current to brakes, thus governing the speed and power with which the trailer is stopped.

Instant Brake Action...No Time-Lag

With ideal road conditions, if your truck is traveling at a speed of 20 miles per hour, the distance required to stop is 30 feet. This distance is increased 29 feet each second of time-lag between the time the brake is applied and the time the vehicle stops. The further the rear wheels are from the driver's seat, the greater the time-lag, and the more distance needed for stopping.

With other type brakes there is serious time-lag but with WARNER ELECTRIC BRAKES there is no time-lag. The electric braking power, applied in any desired amount at the controller on steering wheel, travels instantly to the wheel brakes and regardless of whether the rear wheels are 10 feet or 100 feet back from driver's seat, instant braking is certain...you can depend on a smooth 30-foot stop from a speed of 20 miles per hour.

At the present time the needs of our armed forces must be served first. However, if you are in the "essential" category, we can arrange to furnish Warner Electric Brakes.





WARNER ELECTRIC BRAKE MANUFACTURING COMPANY, BELOIT, WISCONSIN

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RIES



ANYTHING as small as .000025" doesn't register on the human senses. But such minute clues don't escape this electrical sleuth. Picking up the faintest vibration caused by unbalance, the Gisholt Dynetrics locate, measure, and apprehend the offending elements—all in a few seconds!

and finds it at once

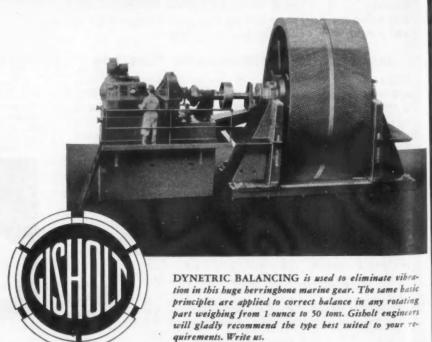
You may never need accuracy down to .000025" in commercial work. But it's there when you want it. And because the Dynetrics provide it so quickly, and so easily, they put static and dynamic balancing of rotating parts on a mass production basis at lower cost than ever before.

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1205 E. Washington Ave., Madison 3, Wis.

Look Ahead...Keep Ahead...
With Gisholt Improvements





for the precision spotwelding of light gauge ferrous alloys

CHECK THESE EXCLUSIVE SCIAKY FEATURES

VARIABLE PRESSURE

Heavy initial pressure, normal pressure during current flow and forging pressure.

HEAD RETRACTION

Working stroke is ½"—retraction of 2½" is electrically controlled by foot switch.

AUTOMATIC WATER SHUT-OFF...Water supply is automatically cut off when head is retracted or control switch off.

BRAIDED CABLES... Used between transformer and upper electrode — result in less fatigue breaks.

ELECTRO VALVE . . . Fastacting d.c. operated solenoid valve controls air to operating cylinder. PREHEAT... Scaly, rusty or coated steels easily welded by virture of preheating feature.

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Controls and contactor

are in hinged cabinet -

simplifies installation.

Provide control over welding circuit, control circuit and foot switch

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Patented Sciaky Timer uses no intermediate relay — operates relay direct from tube.

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WIRING . . . Terminal board wiring — plug and receptacle connections between welder and control cabinet.

TYPE PMCO1-12

SPEED . . . 180 spots per minute on two thicknesses of .032" pickled mild steel.

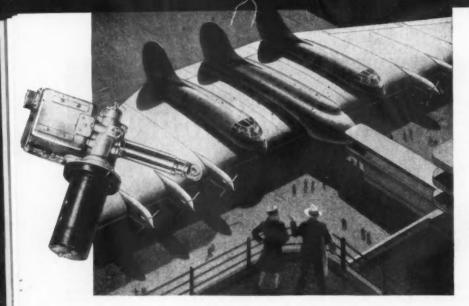
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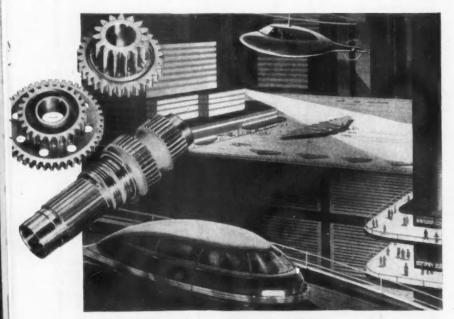
Sciaky specializes in the design and construction of special equipment. Consult us on your resistance welding problems.

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These compact, efficient packages of power will perform many of the jobs in controlling the flight of tomorrow's skyliners. Their high precision has won them a place in today's fighter planes.

PROMISE OF A BRIGHT FUTURE



Mass production of high precision gears will assure more efficient performance—greater compactness and increased speed in tomorrow's machines.

improved speed reducer designs assure greater compactness—smoother operation and a new efficiency to tomorrow's equipment manufacturers.

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The demands of war have brought a revolution in the economical transmission of power. Here at Foote Bros. new advances in engineering—new developments in the manufacture of extremely high precision gears, speed reducers and aircraft devices, give promise to American manufacturers of a new era of "better power transmission through better gears" when the war is won.

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FOOTE BROS. GEAR AND MACHINE CORPORATION

5225 South Western Boulevard, Chicago 9, Ill.

FOTE BROS.

Better Power Transmission Through Better Bears



To left: Ex-Cell-O angular type machine equipped with six spindles to finish bore valve seats and valve guide holes in cylinder head of aircraft engine on a production basis. Each spindle is individually adjustable for depth of cut, as are the tools in the boring bars (boring bars, not shown in picture, are piloted in the fixture).

OSPECIAL MACHINES

EX-CELL-O SIX-WAY MACHINE

n

Below: Ex-Cell-O sixway machine for drilling, broaching and reaming valve guide holes in a magnesium crankcase. This machine is equipped with four standard hydraulic power units and two Ex-Cell-O special hydraulic broaching units. For years Ex-Cell-O has been familiarly known as "the headquarters" for special single-purpose machines for turning out accurate parts at a high rate of speed on machines that frequently perform numerous operations in one setting of the machines that frequently perform numerous operations in one setting of the machines that frequently perform numerous operations. This is why so machines that frequently perform numerous operations in one setting production only a substantial increase in the number of parts is why so work and often bring not only a substantial increase in the number of the machines will figure in the post-duced hourly but also improved quality and reduced unit cost. If you are pland manufacturers have turned to Ex-Cell-O designed machines will figure in the post-duced manufacturers when the new standards will necessitate costs that are competitive war plans of an increasing number of American industries. If you are pland in the production when the new standards will necessitate costs that are competitive war plans of an increasing number of American industries. If you are pland in the production schedules; when the new standards will necessitate costs that are competitive war plans of an increasing number of American industries. Hat are competitive war plans of an increasing number of American industries. Hat are competitive war plans of an increasing number of American industries. Hat are competitive war plants of the wide engineering experience and extensive manufacturing facilities that for many years have made Ex-Cell-O a leader in the precision machine tool field.

EX-CELL-O CORPORATION • DETROIT, MICH.

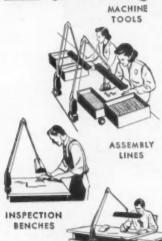


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BOARDS

FLOATING is the only word to describe the effortiess action of the Dazor Lamp. For a slight touch will float this light exactly where it's needed, as easily as a man can move his arm. And it stays put without locking. Raise, lower, push, pull or turn the Dazor Floating Lamp—it remains firmly and automatically held in position. Thus localized lighting acquires new efficiency... increasing production, improving accuracy and safety, lowering costs.

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In thousands of industrial and governmental operations, economical Dazor Floating Lamps are contributing to high productive capacity. They are distributed by electrical wholesalers, selected for ability to serve. Call your electrical whole-

sale supplier or write us for the names of our distributors in your locality. Upon request for Booklet "I" we will also send a 16-page Illustrated Catalog describing Dazor models, features, applications.



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DAZOR Floating LAMPS

FLUORESCENT and INCANDESCENT



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The virtues of high speed, low cost

quantity production are enhanced by the decrease in machining necessary—the dimensional accuracy—the excellent surface finish and the weight saving of Dowmetal die castings. Whether for use on present parts or for those still in the print stage Dowmetal Magnesium Alloys die cast by Dow are ready to go to work for you NOW.

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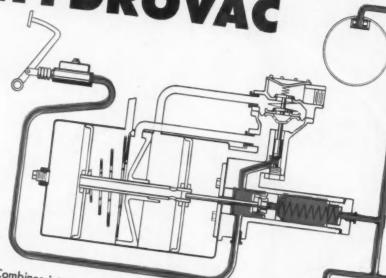
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BENDIX PRODUCTS DIVISION, South Bend, Indiana

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Easy to Install

Easy to Service

Can Be Located
 Any Place on
 the Chassis





AUTOMOTIVE and AVIATION INDUSTRIES

Volume 90

May 1 1944

Number 9

Diamond T Production Zooms to High Level

18

The author of this article begins with these words "An increase of ten times in dollar volume of motor trucks built during the war; an increase of 25 times in service and spare parts volume . . ." From there on he goes into the record of this company and makes it not only interesting reading but informative as well.

General Plan of General Motors for Reconversion

22

The whole industrial nation is "reconversion conscious" at this time. On April 19 the General Motors Corp. presented their plan consisting of six major points, to the House Postwar Committee at Washington. Here it is.

Napier Sabre Aircraft Engine 24
Here are two pages of detailed drawings
of this war plane engine to augment the
descriptions and drawings that have been
presented in previous issues.

Foundry Devoted Entirely

To Magnesium Castings 30
The Hills-McCanna foundry has made an outstanding contribution to the war effort in their production of magnesium castings. The technique of this organization as revealed in this article makes most informative reading.

Griffon Engine in 2000 Hp. Class

33

Features of this new aircraft engine are now available and here they are.

Electrolytic Process of Developing Riveting Machine Fixtures 36 Here is something new in production methods described and illustrated step by step.

AAF Repair Base In New Guinea

Install

Located

ace on

assis

38

The men in the armed forces out front are doing a remarkable job in "keeping them flying." Here is a picture presentation of how they do it.



Reg. U. S. Pat. Off.

Is 3.6 Per Cent Too Much?

By Julian Chase

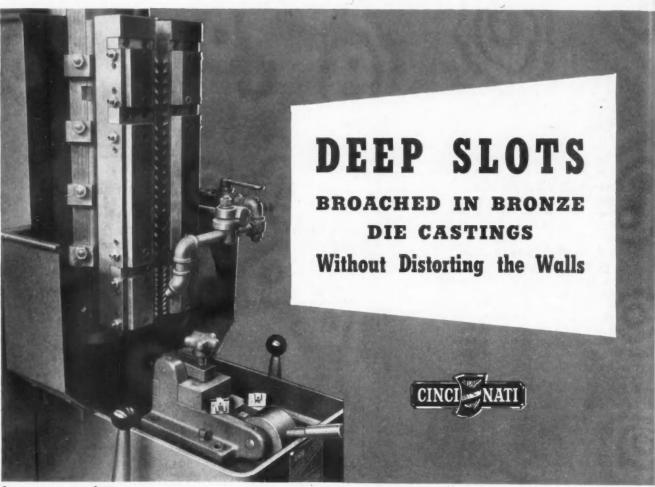
HERE still persists in some quarters a disposition, if not an active desire, to enliven or at least to sustain a smouldering but gradually dying belief in the widespread generation of excessive war profits. Our Comptroller General, as one exponent of that kind of thinking, has lately charged that war profiteers are "on the loose." Another exponent can be pointed out as a Senator who, because of what he describes as "careless housekeeping of the procurement agencies," supports an amendment to S. 1718 by means of which the Comptroller General would be given power to investigate waste and extravagance in post-settlement audits of cancellations and report thereon to Congress.

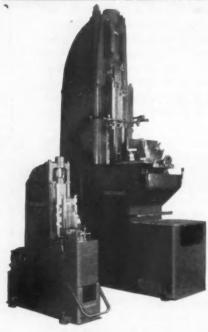
Those manufacturers who have been through repricing and renegotiation and have paid excess profits taxes wonder, no doubt, how the Comptroller, the Senator and others like them can "get that way." They may wonder also why it is that there is and has been consistently so little hullabaloo about the possibility of inexcusable and exorbitant waste in other governmental expenditures. They may well wonder even though, while waste at the spigot and waste at the bunghole are alike in kind but in this case by no means alike in degree, spilled wine from the bunghole is but a stain on the carpet and cannot be put back into the barrel.

But really, is there anything of any extent going on these days in the manufacturing industries that can be truly and broadly described as war profiteering? Studies of corporation profits do not show it. The Government's own watchdog, SEC, has issued statistics covering the 1936 to 1942 earnings of a number of manufacturing companies which are now almost wholly engaged in war work. These figures indicate that, after taxes, profits for 1942 with respect to volume were from 23 to 55 per cent below those of 1939.

The National City Bank of New York, within the past month, has published a study of earnings of 2625 leading corporations, including a comparison of percentages of net earnings to sales for 920 manufacturing companies. For this group, the figures given are 4.8 per cent for 1942 and 3.6 per cent for 1943. A similar earlier study showed that for 1940 the corresponding figure was 7.5 per cent.

If there is any war profiteering in industry, who's doing it?





Here's another CINCINNATI engineered job which required a knowledge of what happens when internal strains are released during the broaching process. The part is a die-cast bronze "carriage". Two deep slots are broached in opposing sides, removing .015" per surface.

To assure accuracy of the slot after broaching, and forestall a "potato-chip" curl of the thin walls, a unique fixture is employed which incorporates a spring clamping device in conjunction with a hand operated clamp.

The broach insert design is important, too. Note the space between the semi-finishing and finishing inserts. This allows the teeth to entirely clear the work and permits the slot to take a new "set" before the finishers pass through. The machine is a CINCINNATI No. 1-30 Single Ram Hydro-Broach.

Many difficult and unusual surface finishing jobs have been solved successfully here at CINCINNATI, where you have the advantage of both milling and broaching Engineering Service. Our engineers will be glad to suggest ways and means of improving your machining methods on present or post-war products.

CINCINNATI Single Ram Hydro-Broach Machines, one-ton and 10-ton sizes. Complete specifications may be obtained by writing for catalog M-886.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO

AUTOMOTIVE and AVIATION Published on the 1st and 15th of the month NDUSTRIES May 1, 1944 Volume 30, No. 9

Reconversion.

a Physical Problem

by B. E. Hutchinson

Vice President and Chairman of the Finance Committee, Chrysler Corp.

NE of the difficulties which I sense as an industrialist is that we tend to think of the war contract termination problem as a problem in agreements and cancellations of contracts and in the financial problems that arise from those termination proceedings. As a matter of fact, the termination problem, as we see it as industrialists, is primarily a physical problem.

The financial and legal aspects of this problem are distinctly secondary to the actual problem of handling-the physical problem of getting this Government material and machinery out, getting our own back in, and organizing and being prepared to resume the production of automobiles for civilian use. The problem of reconversion, as I see it, will exceed in complexity the problem we faced when we undertook to convert our civilian factories for war production. We are now under a great deal more restraint and regulation of one kind or another than we were when the original conversion problem was undertaken. The freedom of action to which we were accustomed in peacetime has been necessarily restrained by war conditions. There was great enthusiasm on the part of everybody to get ready to defend ourselves when we felt that we might be attacked at any moment. Whether there will be the same fervor when we try to get back into peacetime work remains to be seen.

The automobile industry has converted 95 per cent or more to war production. The only civilian production that is left, by and large, is the production of spare parts for civilian automobiles, which in itself is more or less directly related to the war effort and a few items like industrial engines. The contrast of that with a man who is making doughnuts, for illustration, is a very dramatic one. It

doesn't make any difference whether he is making doughnuts for the soldiers and sailors or for civilians. In the automobile business, where the conversion to the war effort was naturally 100 per cent, the reconversion problem will be that much more severe.

Our plants cover about 30 million square feet of floor space, of which 17 million belong to Chrysler Corp., 1,600,000 square feet have been leased and about 11,500,000 square feet have been provided by the Government. In these factories we have 20,365 of our own machines. There also are 20,903 machines owned by the U.S. Government. Seven thousand and thirty-nine of the Governmentowned machines are on Chrysler property. We estimate that it is going to cost about \$21/4 million and will require something over three million square feet of floor space to store the Government-owned machines that are in Chrysler-owned plants today, so that we can resume production of our civilian automobiles. We must put the Government machines on skids, grease them up, put them in a suitable condition to be stored temporarily, and move them out of our plants to somewhere nearby. The cost is about \$300 a machine.

After Pearl Harbor we took our own machines and put them right out in the fields; greased them up, put little sheds over them where we could and wrapped them up in burlap—just went to any extreme to clear the plants and get going on war production. Today, with over 7000 Government machines in Chrysler-owned plants, we are responsible for them as a bailee. Unless we are given clear-

(Turn to page 148, please)

May 1, 1944

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STRIES

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AN INCREASE of ten times in dollar volume of motor trucks built during the war; an increase of 25 times in service and spare parts volume—that's the proud record of achievement marking the extent to which the Diamond T Motor Car Co., has participated in the military truck program.

To visualize the history of this company, one has to hark back to the very beginnings of what is now the automotive industry. From 1905 to 1911, under the leadership of Charles Tilt, founder and present president, Diamond T built passenger car chassis which were sold locally in Chicago with custom-built bodies. The policy then shifted to motor truck building with its real acceleration during World War 1.

By the middle '20s came another important shift in policy. Modernization this time. A policy of building high-speed, six-cylinder engine trucks on pneumatic tires, including the adoption of 4-wheel hydraulic brakes, full-floating axles, modern cab comfort, and distinguished appearance—styling. Some years before the war, Diamond T had looked for a means of dramatizing the exceptional service record of its product. This resulted in an advertised extension of its guarantee to cover 100,000 miles or a full year of operation.

By the middle of 1940, Diamond T offered its facilities exclusively for the manufacture of military vehicles. Since then they have concentrated upon three distinct types—the 6 x 6 four-ton prime mover and

(Below) Looking up the half-track final assembly line in Building 5. Step by step, the chassis takes form while moving from station to station. Sub-assembly stations may be seen at the extreme left in the background.

Diamond T Production

Zooms

(Below) In the center of this view in the military service parts department is the automatic wax spraying machine which is fed by mechanized conveyors. Operators may be seen covering small parts with water-proof acetate cloth while other parts are being boxed.



A view in the body mounting shop showing the lowering of a halftrack armor-plate body.

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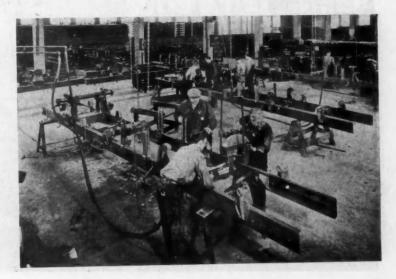
wrecker truck; the half-track, in cooperation with White and Autocar; and the 6 x 6, 12-ton tractors for tank transport and recovery, powered with heavy-duty Hercules Diesel engines.

The wartime metamorphosis has been accompanied by an unprecedented increase in floor space and facilities—new quarters for offices and engineering, new

assembly floors, and a new military service and export packing plant located some distance from the main plant. In 1943 the latter facilities were responsible for the handling, processing, packaging and shipment of service and spare parts to the tune of \$25,000,000. The export packing department encompasses many innovations, to be described later in the article, and they may well set a new pattern in the postwar era.

Riveting of the heavy frames for the 6x6's is done with the giant Hanna squeezers, quickly and silently. Rivets inaccessible to the squeezer are made up hot and are headed using conventional, pneumatic riveters.

This is the Ninety-third in the series of monthly production features



STRIES

Materials handling is easily the biggest problem encountered in this operation. Just visualize the carloads of incoming materials, such as engines, transmissions, axles, tires, armor plate, sheet metal, and other components—not forgetting the tremendous volume of spare parts—that must be received and banked for production, and ultimately moved out of the plant. Fortunately the company already had access to the belt line railroad facilities which exist to perfection in Chicago. A veritable network of freight spur tracks permits materials to be brought in directly at points of usage, and provides ready facilities for the shipment of completed vehicles and boxes and crates.

Advance planning provided for the arrangement of individual buildings so as to facilitate the most convenient location of loading platforms. In other areas there are loading and unloading platforms for truck delivery. A sizable fleet of the versatile Clark industrial trucks of lift type, tiering type, and other types is available for handling materials within the plant. Heavy lifting tasks are mechanized by the use of cranes and hoists. Gravity roller conveyors are employed wherever feasible—as in the service department for handling and packing parts.

In keeping with good management methods, the production operations have been excellently departmentalized. First of all, the sub-assembly and final assembly of the three different types of chassis have been housed in different buildings to maintain complete separation of these functions. Each of the assembly lines is served by sub-assembly stations on which the principal units such as the powerplant, front and rear axles, etc., are prepared.

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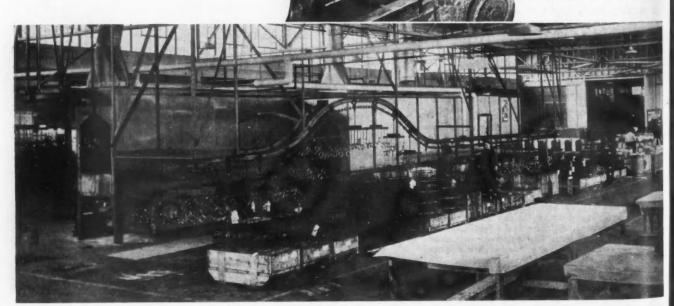
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The half-track operation, for example, is completely self-contained. Bogie parts are received from outside vendors and assembled into complete units. The characteristic rubber-tread track comes in from the outside and is installed on the assembly line. Incidentally, this operation is performed by a single operator, through the use of a special hoist-mounted sling developed by Diamond T.

Diamond T is one of but a few manufacturers to fabricate its own armor plate bodies. This is done for the half-track in a separate department. A feature of this operation is the adoption of Weltronic welding heads with automatic controllers which systematize the welding cycle, current strength, pressure, etc., and

(Right) Illustrative of the versatility of the fleet of Clark industrial trucks used here is the operation of tiering heavy dual-reduction axles.

(Below) Exit side of the R. C. Mahon washing and coating machine, showing rings being removed from the conveyor. Other parts are handled in wire baskets.



remove these critical functions from the control of an operator.

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Many other types of welding operations are performed in this plant. Another example is the arcwelding department in another building where light frames are fabricated from stampings and structural sections.

The concepts of quality and eye-appeal impressed on the organization during normal times have been applied to the finish of military vehicles, and the half-track in particular. Before painting these vehicles, the operators remove all surface imperfections, round off all sharp edges so that military personnel will run no risk of cutting their hands or ripping uniforms. Moreover, the undercoats are sanded and the final finish rubbed to produce a durable paint job.

One thing that strikes the eye of the visitor going through the chassis assembly departments is the absence of the usual chassis spray booths and drying tunnels. The explanation for this is that all chassis components and sheet metal are given the finish paint before installation. It only remains to give the chassis final assembly the once-over to touch up and to cover the few places that may be exposed. This is done after the chassis roll off the assembly line.

Another departure from conventional, so far as the writer's experience goes, is in the method of moving the heavy chassis from station to station along the final assembly lines. The installation of heavy components is a rather fussy and certainly not a speedy operation. That ruled out the use of the conventional

mechanized floor conveyor. In its stead, they have individual lines of overhead monorail systems installed by Jervis B. Webb. When a chassis is ready to move to another station, the operators install a diagonal brace on the chassis and hook the upper end into a ring on the moving conveyor. On the wheeled vehicle assembly lines, of which there are four, there will be found a system of four monorail conveyors for this purpose.

Coming to the chassis frame assembly, we find that the half-track frame is received in a form ready for the application of mounting brackets and final assembly operations. On the other hand, the frames for wheeled vehicles are received in the form of individual structural sections which must be assembled. For this purpose, they have a separate frame department for the assembly and riveting operations. It is of interest to find that most riveted fastenings are produced with the versatile Hanna squeezer which does the job cold and without noise of any kind. Only the rivets inaccessible to the squeezer are made up hot and with the usual pneumatic hammers.

Again as a matter of production planning, there is a separate body installation department. This has its own specialized facilities for lifting bodies and for completing the fastening onto the chassis.

Military vehicles are all equipped with radio and use either radio-shielded electrical equipment or suppression devices. At Diamond T, the half-tracks are all radio-shielded while the wheeled vehicles employ suppression equipment. For this reason, in the final

inspection department for wheeled vehicles there is a radio department equipped with the familiar chickenwire booths, electrically insulated from the floor, for the calibration of each vehicle for suppression installation.

(Turn to page 87, please)

(Left) One section of Building No. 1 where the 6x6 and hand hauler vehicles are assembled. Sub-assembly bays at the side feed in the major units ready for installation.



(Right) Fabrication of half-track armor-plate bodies is done in this self-contained department. Outstanding feature here is the employment of portable Weltronic welding heads with automatic control of all critical welding functions.

THE most comprehensive it has announced, the General Motors Corp. reconversion program was laid before the House Postwar Committee on April 19 in Washington by President C. E. Wilson. Consisting of six points, the program, among other things, calls for the immediate ordering as soon as the war ends of materials for the production of 1,000,000 cars and trucks and the equivalent of other products that General Motors makes.

Making it clear that General Motors realizes the war is yet to be won and victory is still "our business," Mr. Wilson said that when "victory is ours and peace comes, General Motors expects

and must promptly return to the production of more and better things for more people." He pointed out that it is generally realized private enterprise must bear the brunt of providing this postwar activity and that the Government's function is to clear the way for private enterprise to do a successful job. This was declared to be the American way which "gave our country the highest standard of living achieved by any nation in all history."

General Motors, he said, probably has an even greater problem of reconstruction, rehabilitation and reorganization than the other corporations in the automotive industry. With this is mind, its plan for resumption of its peacetime activities at a maximum rate and in minimum time covers the plants, machines, tools, material and men it will need for the purpose. The plan, Mr. Wilson said, will be put into effect and executed progressively and in proper timing as the rigid requirements of a war economy make possible and the rules,

regulations and cooperation of Government permit.

The following plan, Mr. Wilson told the

House Committee, headed by Representative Colmer of Mississippi, will be worked out in detail by each of General Motors' operating divisions:

By L. W. Moffett

1. We will ask the Government and the Services to clarify and to define the production facilities (both those belonging to the Corporation and those which the Corporation or others have been operating for the Services), which will be made available for commercial products, and also what equipment will be declared surplus, and what plants and equipment, if any, will be held as a military reserve for insurance and as part of the national defense.

We will ask for a clearly defined plan for the prompt termination of contracts, including the handling of work in process, inventories, and commitments and the liquidation and disposition of all surplus equipment which may be declared available.

2. We will resume peacetime production as promptly as possible—producing substantially our 1942 passenger car models and the other products which were in production when war was declared. They were all good products—probably the best the corporation ever produced and should be entirely acceptable to our customers in the immediate postwar period. Perhaps a more important factor is that they are the only things that can be produced promptly as any program contemplating new product development and a large tooling program would so delay production that

General Plan of

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a serious unemployment period would occur.

As a part of this program all operating divisions will make lists of machine tools and equipment which have been scrapped, sold to other contractors or to the Government for war production, as these machines and equipment must be promptly replaced either from surplus equipment available from former war production activities or by purchase of new equipment. This is especially important as the Corporation made available to others any of its equipment it could not use on its own war production, and as a result until this

equipment is replaced there will be serious holes in the production lines which would practically prevent the completion of any cars or other complete products.

If conditions permit, toward the end of the war, and after all machine tool requirements for war production have been filled, orders will be placed with machine tool builders for much of this equipment as will not be available through prompt release of machines engaged in war production.

3. The Corporation will authorize the prompt ordering of materials required to produce one million cars and trucks and an equivalent quantity of the other products it produces, and at the earliest possible date when the war is over, telegrams will be sent to all suppliers and subcontractors authorizing them to start production immediately. This material will be accepted, even though some of it can be produced faster

than actually required, in order to give the quickest possible employment and allow our suppliers to proceed with their activities while the necessary plant rearrangements and other bottlenecks in commercial production are being overcome.

This follows somewhat the country's pattern for starting war production. When we realized we were unprepared, war material producers were encouraged to make any quantities they could, even though the results achieved did not give a balanced military program.

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4. As soon as conditions permit, and some of this work may be possible during the war, research and product development will be resumed. The timing on

and technological processes discovered and developed in the stress of war.

Mr. Wilson told the Committee that neither Government nor industry will be forgiven if individually or jointly they have failed to provide ways and means to maintain productive activity in the country at the highest possible level and in the shortest possible time. Insisting that the private enterprise must take the greater responsibility for postwar activity, Mr. Wilson declared that if American democracy is to survive and the ambitions of its citizens are to be realized, experiments in communism or socialism in the postwar period must not be tried. Likewise, he said, tre-

mendous Federal expenditures not directly contributing to the welfare and standard of living must be avoided. Such non-productive expense and activity, the Committee was told, directly reduces the average standard of living by the percentage that such expense and activity is of the national income or total activity of the country.

"Man hours lost through unemployment, artificially short working hours, dissipation, ill health and idleness have proportionately the same effects," said Mr. Wilson. "The men and women of our country will not again stand for the unemployment, hardship and WPA standard of living of the thirties.

"The production and consumption of goods per capita is the true measure of the standard of living of a country and industrial activity substantially exceeding that of the immediate prewar period and approximately that of the war period must be achieved in a very short time after the war if we are also to win the peace. The philosophy of opportunity, production and plenty must replace the false philosophy of regimentation, restriction and scarcity.

"The desired result can only be realized if all business and industry tackle the problem with courage, vision and imagination. As the largest producer of consumer goods in the country, the Corporation has a great responsibility in the situation, and is very desirous to do its full part.

"It is not generally appreciated that a large segment of industry faces an even bigger problem in organizing and promptly establishing a high level of industrial activity for peacetime products than it did in organizing for the war production. Nor is the time factor involved in

(Turn to page 154, please)

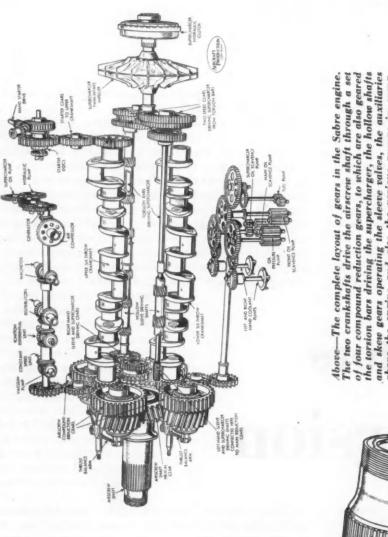
General Motors Reconversion

this activity will depend on the progress of the war and the point of view of the Government and the Services. This product development is essential so that more and better things can be made for more people and is a necessary part of and must be reasonably appraised before additional expansion of the Corporation's prewar facilities can be made.

5. The Corporation will appropriate the hundreds of millions of dollars necessary for a substantial increase in its prewar production capacity for cars, trucks, household appliances, Diesel engines and Diesel electric locomotives.

Immediately after the war, a plan for the purchase of buildings from the Government or others, or the construction of new facilities to carry out the program will be put into effect. This will promptly employ many men on the construction, rearrangement and tooling of these facilities and make possible the employment in the near future of men and women who will be required in the production lines to carry out the big industrial expansion for consumer goods required to expand the standard of living of the country and make more and better things for more people.

6. At the right time the Corporation will again fill its research, engineering and development staffs and aggressively continue its past policy of continuing product improvement. This will include the development of new products and the proper exploitation of new inventions and the application to the art of metal fabrication of all scientific knowledge, use of materials



the torsion bars driving the supercharger, the hollow shafts and skew gears operating the sleeve valves, the auxiliaries above the engine and also the various pumps in sump. (Courtesy of FLIGHT, London Lest-Cutaway view of the front end of the (Courtesy THE AEROPLANE, London) Sabre engine

issue of Automotive and Aviation Industries For description of this engine, see March 1

Napier Sabre Aircraft Engi

show the pair of crankshafts mounted one the pair of crankshafts mounted one show the other in the crankcase. Each crank-pin has a pair of connecting rods operating in cylinders opposite to the crankshaft concerned and the twenty-four cylinders are arranged in two flat rous of twelve cylinders apiece. On each side of the two crankshafts and between the upper and lower sets of cylinders is a torsion bar or shaft which operates the sleeve valves through skew gears. These shafts, driven by the airscrew gearing, are extended at the rear of the cylinder blocks to drive cylinders have been removed to important features of upper row of

(Courtesy of Flight, London)

May 1, 1944

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the two-speed supercharger.

Quick Release Fastenings

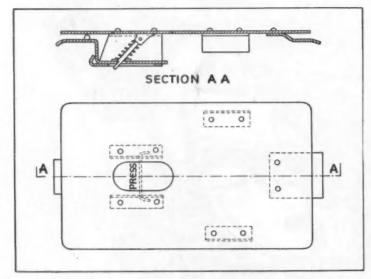


Fig. 1-Showing the fastener on a He. 111 inspection cover.

PRIMARILY for the information of aircraft designers and manufacturers, the British Ministry of Aircraft Production has prepared and issued the following particulars and the accompanying illustrations of some of the types of quick-release fasteners found in German warplanes. The examples dealt with are chiefly those used to secure doors and covers giving access to engines and guns, for inspection and maintenance, and those at recharging and refueling points.

In every case the fastener can be opened or closed by hand or by means of a screw driver. All are spring-locked to prevent them from working loose and in no case can the spring be released except by movement of the part of the mechanism provided for the purpose. In all cases the fastener lies flush with the skin when in the closed position.

Inspection Cover on He 111

The type of cover plate illustrated in Fig. 1 is located over the opening by thin stampings riveted to it. The bolt is withdrawn by pressing on a red-colored portion of the tilting plate, which is a small die casting. If an attempt be made to push the bolt back, the shoulder of the lever engages with the edge of the hole through which it passes to prevent further movement. It is held in the open or

By M. W. Bourdon

Special Correspondent of AUTOMOTIVE and AVIATION INDUSTRIES in Great Britain

closed position by the helical spring compressed between the spindle of the tilting plate and a washer resting on the bolt.

Fuel Tank Filler Cover on Ju 88

The Junkers Ju 88 fuel tank filler cover, illustrated in Fig. 2, consists of a rim of thin material to which the cover plate is riveted. Through slots in this rim pass two bolts which, on being extended, engage with slots under the surrounding skin and hold the cover in position. To unfasten, the central screw head is pressed down with a screw driver against the spring show until the projections (1) clear the recesses into which they are held by the spring. They can then be rotated by use of the screw driver slot. Rotation in either direction is limited by

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projections (3) on the die casting that forms the central part of the cover. To prevent loss of the cover when it is unlocked a leather strap with end fittings of thin pressed sheet is provided, as indicated at the bottom left hand corner of the plan view in Fig. 2. A similar type of quick release cover is used for the fuel filler of the Focke-Wulf FW 190, but in this case there are three bolts and a hinge on the fourth

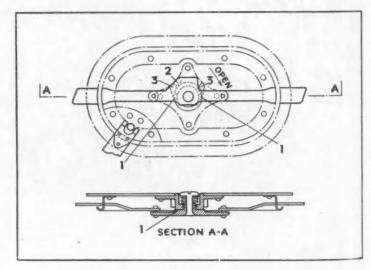
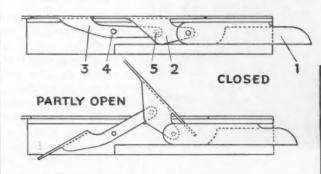


Fig. 2—The fuel tank filler cover in a Ju. 88.

on German Aircraft



side. A modified form also is used on the door at the tail wheel retracting mechanism.

Access Door on FW 190

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Large doors in the wing of the FW 190 give access to the cannon and other equipment. Each of these is secured by a number of fasteners of the type shown in Fig. 3. A cast frame riveted to the skin contains a cast bolt (1) and two pressed links (2) and (3). The latter is mounted on a fixed spindle (4). A helical spring encircling this spindle tends to rotate the link (3) clockwise, which results in link (2) being held down against the casting with the bolt (1), extended and prevented

from being pushed back while the links (2) and (3) are in line. To unfasten it, link (3) is pressed against its spring, the effect of which is to raise link (2), which can then be pulled up as shown in the lower view. Lifted beyond this position it will stay open with the bolt drawn in. To fasten, link (2) is pushed forward and down until the spring raises link (3) and holds both parts in line. Fig. 3 also shows a fastener in open position.

Access Door on Messerschmitt Me 109

The covers over the fuel filler, the charging

point for compressed air used for gun cocking, etc., on the Me 109 are secured by fasteners of the type shown in Fig. 4. In each

Fig. 3 — Type of fastener used on doors over the cannon in the FW.

190 wing.

case the cover is hinged at one side to a ring (1). riveted below the skin to form around the opening a ledge against which the cover closes. Opposite the fastener the ring is bent inwards to form a lip. To fasten the cover it is folded down against the spring hinge and the stamping (2) levered down until its shorter end hooks under the lip and until the projection (3) catches under the stamping (4). To release, the part (4) is pushed down, as

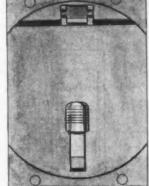
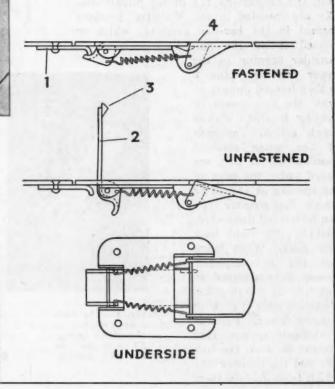


Fig. 4 — Fastener used on various cover doors in the Me. 109F.



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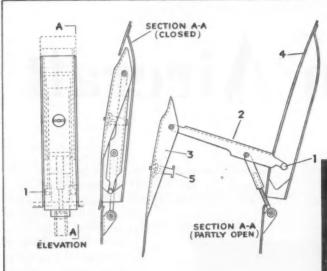


Fig. 5—Fastener for drawing together the sections of the B. M. W. cowling in the FW. 190.

in a straight line so that when the latch is unfastened with a screw driver the outer member (3) springs out. The length of the bottom link can be adjusted by rotating the whole fastener when open, so that the rod is screwed into the barrel, thus enabling the cowling always to be drawn tight. This type of fastener is shown in open and closed positions.

Engine Cowling Fasteners on the Dornier Do 217

The cowling fasteners used on the Do 217 are of a similar type to that used on the FW 190. It is shown in Fig. 6. In this case the outer member is omitted and the main link (1) is locked in the closed position by a catch (2)

which hooks over a bar attached to the upper section of the cowling. This catch is released by pressing in the plate (3) against the spring that surrounds the spindle (4). The fastener can be adjusted by rotating the main link with its nut (5) on the threaded link

shown in the central view, which allows (2) to spring up and disengage from the lip so that the hinge spring can open the door. One of these covers closed is shown in this illustration.

Engine Cowling Fasteners on FW 190

The sections of the cowling of the BMW 801 engine of the FW 190 are drawn together by the fastener shown in Fig. 5, which provides considerable leverage to draw the two parts together tightly. In closing the unit, the projections (1) of the middle link (2) are inserted in the V-shaped brackets formed in the box-like pressing, which is

riveted inside the rectangular opening in the upper cowling. Link 2 is then levered upward to draw the two pieces of cowling together with a toggle action. The nose of the outer stamped member (3) is then engaged under the edge of the opening at (4), after which the member (3) can be levered downward, pushing (2) right back into place. When member (3) is completely closed, it is attached to link (2) by turning the T-shaped latch (5) with a screw driver. There is a helical spring (not shown) between the link (2) and the member (3) which tends to hold them

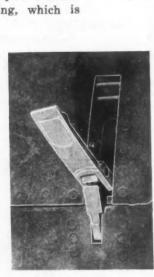
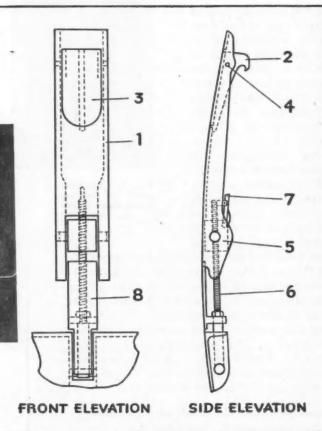


Fig. 6—The fastener (similar to that shown in Fig. 5) used on the Do. 617 cowling.



(6), after releasing the catch (7), normally held in engagement with a projection at the top of the link (6). The space in front of the latter is filled by a plate (8), secured to it by a nut and locking tab. The appearance of this fastener when half open is shown in the photograph.

Fuel Filler Cover on Do 217

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The means by which the fuel filler cover is secured on the Do 217 is shown in Fig. 7. By pressing with a thumb and finger the two plates (1) are tilted through 90 deg, whereupon they can be pinched together so that the two bolts (2) are drawn against the stop (3). The bolts slide between two angles and are held against the skin by four plates (4), which are riveted on. Normally the bolts are held extended by four springs, so that their turned-up corners (5) rest against the plates (4). The plates (1) must be tilted before the bolts can be pressed together, otherwise their inner edges bear against the cover plate at (6). These plates (1) are normally held horizontal, with their noses resting on

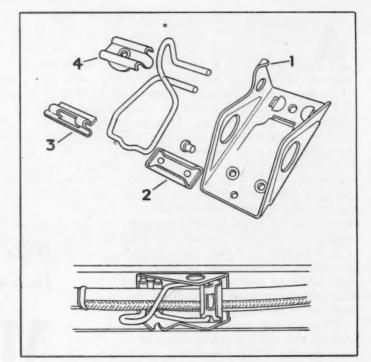


Fig. 8—"Mouse trap" type of clip used to secure electric cables in their conduits.

the projections (7) of the bolts by helical springs encircling their spindles.

Cable Clips

Fig. 8 shows a "mouse-trap" type of clip used to secure electrical cables into the shallow pressed channel conduits in which they are laid. It consists of four simple stampings and a length of spring wire bent to the shape indicated. The clip can be held wide open by pressing the wire past a projection (1) on the side of the frame. The cables are then passed in sideways and when the spring is released from the projection they are held down under the pad. This pad is made up by placing the pressing (2) on the wire and then sliding the unit (3) over it. The ends of the wire are held under the part (4), which is riveted to the frame.

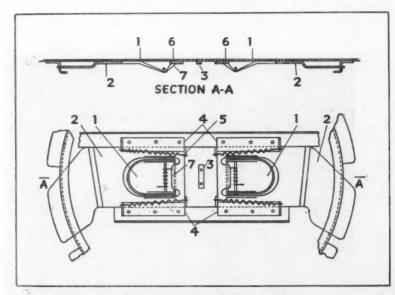


Fig. 7—Method of securing the fuel filter cover on the Do 217.

M.E.W.A. Regional Conference in New York

A discussion of ways and means of handling Government surplus automotive parts and equipment and the presentation of the Association's new advertising program in trade magazines featured the Regional Conference held by the Motor and Equipment Wholesalers Association at New York on April 17 and 18. After detailing the difficulties which are expected in the disposal of surplus automotive parts, supplies and equipment, A. H. Eichholz, General Manager of the Motor and

Equipment Manufacturers Association, recommended that a joint committee representing all the automotive associations be appointed to draw a plan which would then be presented to congress as reflecting the thinking of the entire automotive industry regarding the best method of handling and disposing of surplus automotive war goods. It was also recommended that the manufacturer of each product should have the opportunity of purchasing his particular product at a price

above that named by the highest bidder.

To still further insure that such products would not get into speculators' hands it was also voted that the proposed committee include a clause in its recommendations permitting the Government to recapture any parts or equipment which would be sold in a manner violating any law that might be passed.

Details of the advertising program of the Wholesalers Association were pre-(Turn to page 150, please) CKNOWLEDGED as one of the major sources of magnesium sand castings for military airplanes, the Hills-McCanna Co., Chicago, Ill., has a background of almost 75 years of operation in related fields. The company is noted for its three major products—Saunders patent leak-proof valves, force feed lubricators, and chemical proportioning pumps.

Just before the war, the foundry operation was concentrated upon sand-cast alloys such as aluminum-

bronzes, manganese-bronze, phosphorbronze, red brass, yellow brass, and Dowmetal. In 1942 the entire foundry was converted to the casting of magnesium alloys for the war. This entailed a complete conversion of facilities, the installation of new equipment for sand handling, for melting, for pouring, etc., together with the acquisition of new molding equipment, core blowers, and a variety of other equipment essential to a modernized foundry operation.

It is of interest to note that the company was one of the original licensees of the Dow Chemical Co., for the sand-casting of magnesium alloys. At the present writing, the foundry is producing a large variety of magnesium castings for the gamut of military airplanes, including such items as—carburetor throttle bodies, landing gear wheels, blower sections, wiring harness rings, brake parts, camera frames, parts for gun turrets, for gun controls, and for airframes.

Being one of the newest and among the most valuable structural materials known to industry, magnesium has introduced many knotty problems to the foundries. Hills-McCanna with its background of early experience and cooperation with Dow engineers has acquired an invaluable know-how in the handling of this metal and has been successful in exceeding the monthly quota of tonnage originally established by the armed forces. This record was achieved through the application of improved foundry methods and an exceptional standard of quality promoted by the metallurgical department. This control starts

Hills-McCanna Foundry Devoted Entirely to

Magnesium



(Above) Castings are heat treated in furnaces such as the ones shown in this view, under conditions of accurately controlled temperature and time. The racking of castings is not random but in accordance with specified methods developed by the metallurgical department.

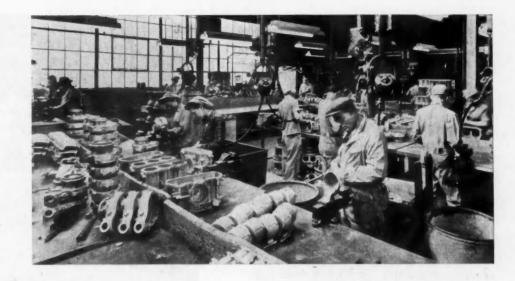


(Left) In the rough cleaning department—at the left is the battery of three heavy duty Tannewitz band saws which are used for removing gates and risers. American Wheelabrator equipment is in the same room but out of the field of this photograph.

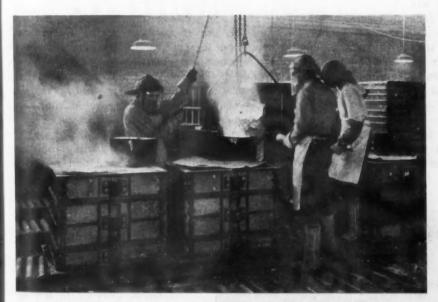
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Perspective of the final cleaning and polishing room with benches for burring and filing in the foreground. The Kellerflex heads may be seen overhead. At the extreme left, along the wall, is final inspection of finished castings.

By Joseph Geschelin



Castings



Scene in the molding department showing the pouring of magnesium from ladles transported on the overhead rail system. The molds are poured on a system of gravity roller conveyor lines.

with sampling of the alloy ingots, extends to the inspection of metallurgical samples of each heat. It is also responsible for the quality of purchased sand and the prepared sand for core making and molding.

Perhaps the most significant aspect of the operation of this foundry is the insistence upon perfection. In the first place, no new work is accepted for production until the management is satisfied that the job can be done properly. To this end, each case is treated as a research project leading to the establishment of the proper alloy, recommendations as to modifications in physical design, and development of suitable precision pattern equipment.

Magnesium is so critical and so sensitive to handling in the foundry that pattern equipment must be designed with an eye to extreme precision. The greatest care is exercised to assure perfection, since the internal structure of the casting is so sensitive to the correct design and handling of cores and molding procedure. To assure perfection of internal structure, the metallurgical department carries on a regular program of sampling analysis by X-ray methods. Quality control also is achieved by physical methods of surface inspection, jigging, template checking of contour, and actual measurement of wall thickness by special calipers.

Melting the metal is one of the most important steps in the manufacture of magnesium castings as it is possible in the operation to ruin an entire heat if care is not exercised. The metal is melted in large

holding furnaces and transferred from these furnaces to crucibles ranging from 125 to 300 lb. These are placed in small furnaces and elevated to a temperature of 1550 F. The metal is then cooled as rapidly as possible to pouring temperature and poured immediately with a minimum of turbulence. Extreme care must be exercised here also because too long soaking of the metal will change its mechanical properties considerably. It also is necessary in the pouring operation to thoroughly cleanse the metal by "fluxing."

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In the machine shop—close-up of the Bullard V-T-L with a landing gear wheel in place ready for removal of heavy gates and risers. The entire section at the upper end of the casting above the rim and the heavy ring at the lower end are removed.

All melting furnaces are fired by oil.

Inspectors are constantly on the alert in the Melting Department to make certain that the metal is heated and poured at the proper temperatures recorded with electrical recording pyrometers. Then there is constant inspection by competent metallurgists to determine the grain size and structure. Photographs are taken of sections of castings and physical and chemical properties established from each heat. Castings for critical parts, in some instances, are 100 per cent X-rayed to make certain there are no defects present. In less critical castings, X-ray examinations are made at random in search for possible defects. Customers are supplied with affidavits pertaining to the physical and chemical properties of each casting shipped.

Due to the lightness of magnesium, it is necessary to pour from two to eight times the weight of the casting. This excess metal goes into the molds in the form of risers and gates to allow free entry of metal into the casting; also to allow for proper cooling and shrinkage. The gates and risers are removed in the cleaning operations and later go back for remelting. It also is necessary, due to the fact that the metal chills rapidly, to provide steel chills on heavy casting sections, to

prevent incorrect physical properties.

In preparing sand for molding, it is necessary that it be reconditioned at the end of each pour, because certain ingredients burn out and moisture content



changes. Moisture content is extremely important in assuring the proper result. Various binders for holding the sand together, and elements to prevent the metal from burning when it enters the mold are constantly added. The sand is mulled and mixed and returned by the overhead conveyor to the various molding stations. In the case of core making, the sand is used but once. After casting, the core sand is removed in the knockout room, crushed, and sent to the refuse pile. The iron, used for holding the core together, and the chills are recovered and returned

to the core room, and the same applies to the molding floor. Chemical and physical analysis is made of molding and core sand daily.

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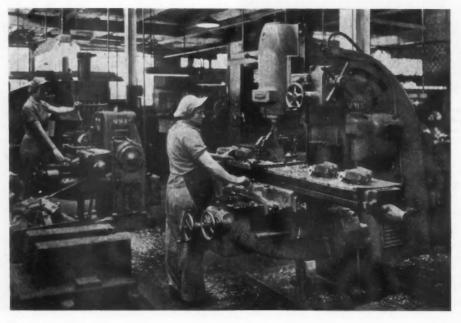
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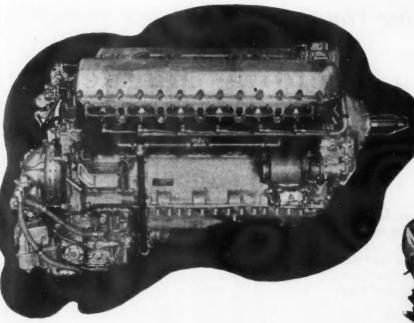
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In the West bay is a battery of large rollover machines that eliminates a great amount of the manual labor. In addition, the necessity of shoveling sand is eliminated by means of over-

(Turn to page 90, please)



"Another view in the machine shop, showing a Cincinnati vertical milling machine in the foreground; and a Kearney & Trecker mill at the left. The part being machined on the Cincinnati is practically the only magnesium casting in the plant that is machined before shipment to the customer."



(Left) Starboard side of the new Griffon engine

(Below) Rear (supercharger) end. At the right above the supercharger casing is the gearbox for the accessories

New Rolls-Royce Griffon

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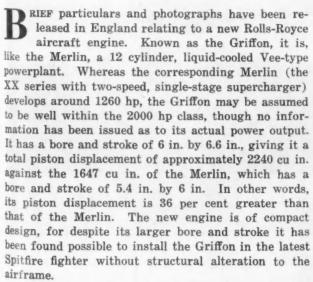
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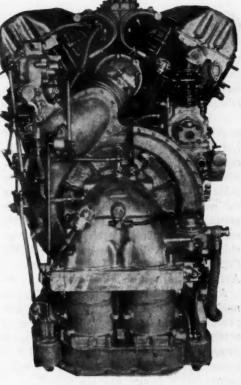
IES

Engine in 2000 hp. Class



In cylinder arrangement and dimensions, the Griffon is identical with the Rolls-Royce racing engine of 1930 which enabled the Schneider Trophy to be won outright for Britain and which, known as the "R" type, was later fitted to Sir Malcolm Campbell's "Bluebird" that broke the land speed record and to his boat which still holds the water speed record.

The "R" type Rolls-Royce engine was produced spe-



cially for comparatively short-distance work. At a normal speed of 3200 rpm, it developed 2350 hp for a total weight of 1630 lb, or 11 ounces per bhp. The Griffon, it is emphasized, is not even partially a modified version of the racing engine. It is an entirely new product, capable of giving reliable service over lengthy periods of use, as required for normal military operations.

As fitted to the new Spitfire, the Griffon has a two-speed mechanically-driven supercharger of the same general type as that of the Merlin XX, as distinct from the two-speed, two-stage supercharger with inter-cooler fitted to the Merlin 61. It gives the latest Spitfire an improved performance not only at low altitudes, but also at heights between 15,000 and 25,000 ft, within which range a large proportion of aerial combats take place.

A feature of the Griffon not normally associated with the engines of fighter aircraft is the provision of a gearbox, shaft-driven from the engine, on which are mounted the mechanically driven accessories required

(Turn to page 82, please)

Joint Fit-up and Backing Plates for

Welding Magnesium

By F. A. Wassell

Welding Engineering Div., General Electric Co.

NE of the most important factors contributing to the greatly expanding use of magnesium alloys in industry is helium-shielded arc welding, which utilizes standard types of direct-current machines with either manual or automatic welding equipment. For the welding of the lighter gages of mag-

nesium, up to around 3/16 in., small welders of approximately 150-amp capacity are used; but for the welding of the heavier gages or for high-speed welding, machines of about 300 amps are required. Magnesium is always welded with reverse polarity, with the electrode positive and the work negative, since straight polarity results in an unstable arc and excessive spatter. A general description of heliumshielded arc welding was published in the Sept. 15, 1942, issue of AUTOMOTIVE and AVIATION INDUSTRIES.

Any of the standard types of joints, and modifications of them, can be used in this process. Some of the joints most commonly used are butt joints of the square groove, single "V," double "V," and "U" types. Others that can be used are fillet, corner, edge, flange, and lap joints.

Good fit-up of the work is of primary importance, especially when light gages of metal are butt-welded by the free drop-down method. The free drop-down method requires no backing, and the filler metal

is allowed to drop through to the underside of the work to form a reinforcing bead on the bottom of the weld. Variations of as little as 1/32 in. in the fit-up of the edges of the plates will cause metal to drop down unevenly, resulting in a weld of uneven appearance.

The need for clean surfaces in welding magnesium alloys cannot be overemphasized. Magnesium alloys are often given a protective coating by some such method as chrome pickling. If these coatings are not removed before welding, they introduce porosity and (Turn to page 82, please)

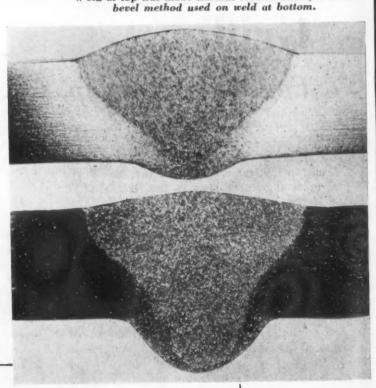
Fig. 1 — Macrographs (10-times enlargement) of helium-shielded arc welds on light-gage magnesium. Weld at top was made without reverse bevel; reverse

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A general description of helium-shielded arc welding was published in the Sept. 15, 1942, issue of Automotive and Aviation Industries.

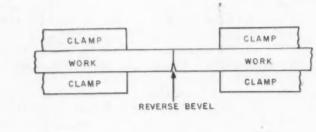


Fig. 2—Drawing of reverse-bevelarrangement used in helium-shielded arc welding of magnesium. Drawing is exaggerated for illustration purposes.

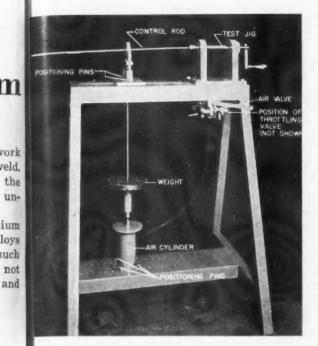


Fig. 1—Proof-loader for \%-in. flashwelded control rods.

PROOF-LOADING machines for testing flash-welded control rods were designed and built in the Engineering Research Department of North-American Aviation, Inc., and the Department also specified the procedure to be followed in operating the machines. The flash weld is proof-loaded by holding the fitting at one end of the assembly in a jig, and subjecting the weld to a predetermined bending moment by loading the tube as a cantilever. By rotating the tube, the desired bending moment is applied to all portions of the weld. The bending moment is of such magnitude as to produce a tensile stress at the weld equal to 75 per cent of the yield strength of the tubing material. The method of calculating the required bending moment is explained in the Appendix.

To cover the range of sizes of tubing being tested, two proof-loading machines were built. One machine (Fig. 1) is designed for testing only 5/16 in. and $\frac{3}{8}$ in. control rods, and the second machine (Fig.

2) is designed for proof loading 3/4 in. and 1 in. sizes of tubing. Various jigs are used in conjunction with the machines for accommodating the different types of end fittings welded to the tubing. These jigs are case-hardened for increased wear resistance. The first proof loader makes use of various sizes of weights to give the desired load, whereas the second machine utilizes pressure acting on a piston to produce the required load.

Testing Machine for 3/8 In. Control Rods

By referring to a table of load settings for the rod to be tested, the proper load and position of the load may be obtained. With this weight in the proper position, the air valve is turned on to raise it. The rod

Flash Weld Proof-Loaders

By Weller Johnson

end is inserted into the jig, and the air valve is turned to the "off" position. The weight then drops, thereby applying the specified bending moment to the resistance weld.

Provision is made for controlling the rate of fall of the weight, so as to reduce the impact stresses in the rod. This is accomplished by means of a throttling valve in the pressure line to the air cylinder. The photograph (Fig. 1) does not show this valve, but its position is indicated. The rate of fall of the weight is governed by the degree of throttling in the valve.

The rod is revolved through two turns to apply the desired maximum bending moment to all portions of the weld. The air valve then is turned on once more to raise the weight, and the rod is removed from the jig. This same procedure is then repeated for the other end of the rod.

Testing Machine for 3/4 In. and 1 In. Tubes

Using the proper set of jaws, the tube to be tested is set in the chuck, and both Allen set screws are tightened with the wrench. With the air valve shut off, the pressure regulator is adjusted until the correct pressure is read on the regulator pressure gage.

(Turn to page 152, please)

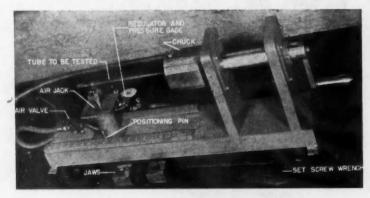
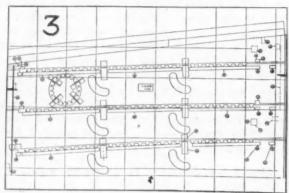
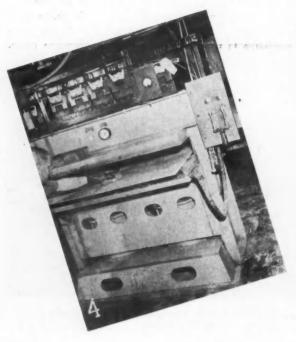


Fig. 2—Proof-loader for 34-in. and 1-in. flashwelded tubes.

RIES







Electrolytic

By Thomas T. Tobin

Production Design Engineer,

John T. Howard

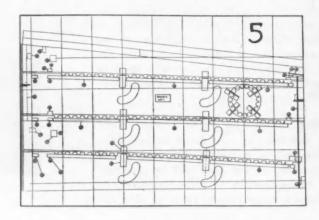
Standard Tooling Engineer, Lockheed Aircraft Corp., Factory "A".

THE Prest electrolytic process, extensively used at Lockheed for the reproduction of engineering drawings made on metal, has been applied recently in making the blanks for the main frames of Erco Automatic Riveting machine fixtures. There are several advantages of this process over the former method of constructing fixtures from a tool or fixture design drawing. Any number of identical reproductions can be made on duralumin blanks from one scribed master. Nearly all measuring is eliminated in fabricating the fixture as all trim lines for machining edges, notches and cutouts are shown, as are lines for locating related parts. Thus, duplication of effort by the fixture builder on layout work of several identical fixtures is reduced to a minimum.

All assemblies riveted in this type of fixture are identical and interchangeable, which insures that all units, whether made on one machine, several machines, or even in different plants, will be identical.

The entire process, beginning with a hand riveted and fitted assembly and ending with an identical assembly riveted on the Erco Automatic riveting machine in a fixture developed from the original sample, is shown pictorially in the accompanying photographs.

A sample assembly made by hand to engineering drawings and actually fitted off the ship is submitted to the tool designer to lay out an exact master. He must determine the location of backing blocks, quick acting clamps, and trim lines for machining edges, notches and cutouts.



C Process of developing Erco Riveting Machine Fixtures

- The tool designer scribes the layout onto a coated metal to allow reproduction to be true view.
- Picture of finished master drawing on template.

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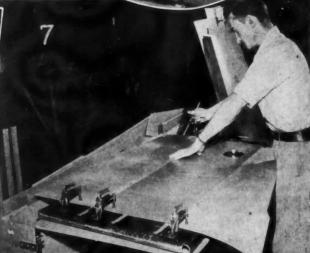
- Template is placed in the reproducing press, scribed side up, and coated with ferrous sulphate electrolyte. A duralumin sheet, also coated with electrolyte, is then placed over it, the coated surfaces in contact. The press is closed and current applied. The current flows between the parts only at the scribed lines and electrolysis causes iron in these lines to be deposited on the duralumin sheet.
- Picture of duralumin reproduction showing positive view.

 The small semi-circular notches will serve as locaters against the Erco riveting machine stripper after being routed out, thus locating fixture and parts in relation to the machine. Other cutouts are made and blocks and quick acting clamps are attached as shown in Figure 6. Flanges are formed along the edge of the fixture to raise it for clearance.
- 6_{\bullet} Substructural sections are placed in completed fixture and clamped against backing blocks. Access to clamps is by means of finger holes as shown.
- 7 Skins are placed in fixture and clamped.
- 8 Loaded fixture is placed on adjustable rollers and riveted by means of the Erco Automatic riveting machine.
- 9. Finished part is removed from fixture and it is now ready for reloading.







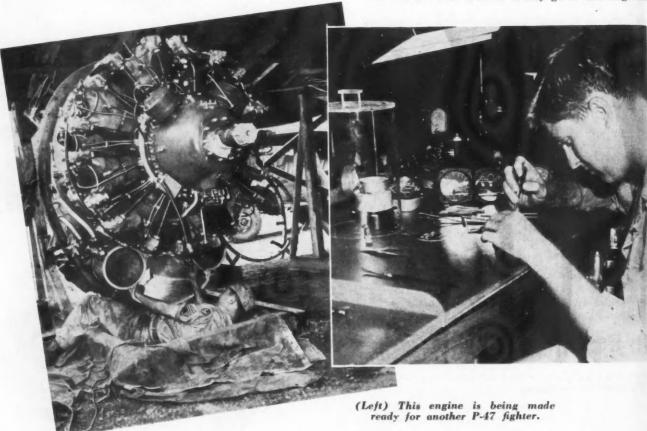


STRIES

AAF Repair Base i

Acme Photos

(Below) Instruments and bombsights are repaired in air conditioned buildings, in which the temperature is held at 72 F. Outside it may go to 110 degrees.



(Right) From this "boneyard" parts are salvaged for damaged planes. In the background are Flying Fortress, Liberator and Airacobra fuselages. The belly gasoline tanks (foreground) have been returned to this salvage pile for repair and future use.



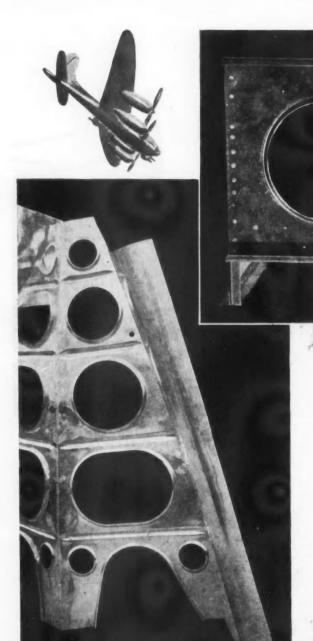


(Above) To keep American bombers and fighters in tip top condition for operations in the South Pacific, a system of well-organized repair bases is necessary. In New Guinea the Army Air Forces have set up a maintenance base near the Owen Stanley mountains, where these photographs were taken recently. Ground crews often must work in extreme weather ranging from bitter cold, tropical downpours to searing heat. This photo shows a Liberator B-24 being completely rebuilt at the New Guinea base.



(Above) A typical scene in the hangar where some P-38 fighters are being overhauled.

(Left) A self sealing fuel tank from a Liberator bomber undergoing repair.





substituted for riveting on B-17 Sub-Assemblies

By F. C. Pipher
Production Design Engineer,
Lockheed Aircraft Corp.

Command receiver support assembly and rear wing fillet fairing which are among the sub-assemblies on the B-17 bomber now being spot-welded with a saving of man-hours and cost.

NVESTIGATION by Lockheed Aircraft Corp. engineers at Factory A of the possibility of using spot-welded connections instead of riveted connections on typical sub-assemblies for B-17 airplanes has revealed average savings in cost of 57 per cent over the hand riveting method. All assemblies performed functions of a secondary nature and carried loads of small magnitude, such as the command receiver support assembly and the rear wing fillet fairing installation, which are shown in the accompanying illustrations. The parts were such that design

changes were not necessary in the parts themselves or in the tooling to make the conversion. Substantial savings in time required for the joining operation were found, as shown in the following table of six typical assemblies.

Part	lotai			Hand Rivetin
Bulkhead Assembly	(Station	6)	0.963	2.330
Dorsal Fin			0.707	1.550
Side Window Spoiler	*******		0.263	0.990
Main Door			0.135	0.517
Command Receiver S			0.243	0.607
Rear Wing Fillet Fai	ring		 0.660	0.986

The assembly of the dorsal fin, main door and rear wing fillet assemblies consisted of spotwelding 24ST alclad aluminum alloy to 24ST alclad aluminum alloy. Some of the detail parts of the remaining assemblies were made of bare 24ST aluminum alloy sheet and extrusion. The thickness ratio of the materials welded did not exceed the approved 3 to 1 ratio. All parts were processed for spot welding in accordance with

(Turn to page 88, please)

Convair Model 39 Postwar Airliner

ODEL 39, the long range commercial transport being developed by Consolidated Vultee Aircraft Corp. for the postwar market, incorporates the Davis wing, four-engined powerplant and tricycle landing gear of the B-24 Liberator bomber in combina-

tion with a specially-designed fuselage. Specifications and illustrations of the new airliner are presented on this page. Interior arrangements are in charge of Henry Dreyfuss, industrial designer, who has prepared four plans-center aisle flanked by pairs of seats slightly canted, seats placed back-to-back in groups of three and one, pairs of seats on each side of the aisle convertible into upper and lower berths, and a transport sleeper with upper and lower berths. Other features include polaroid windows, full-length plastic mirrors, and individual reading lights and "pillow" radios. Initial flight tests were successfully completed in April.



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Engine—Four 1100-hp Pratt & Whitney Wing span—110 ft. Fuselage length—90 ft. Max. fuselage diam.—10 ft. 6 in. Passenger capacity—48-52 (24 as a sleeper plane).

plane).

Basic gross weight—56,000 lb.

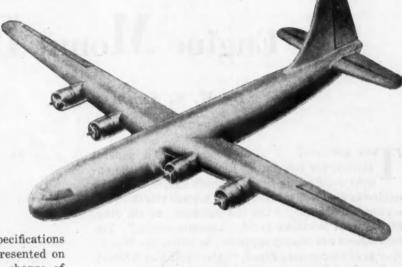
Provisional gross weight—62,000 to 64,000 lb.

Cargo payload—12,000 lb.

Normal cruising speed—240 mph (@ 60 per

cent power).

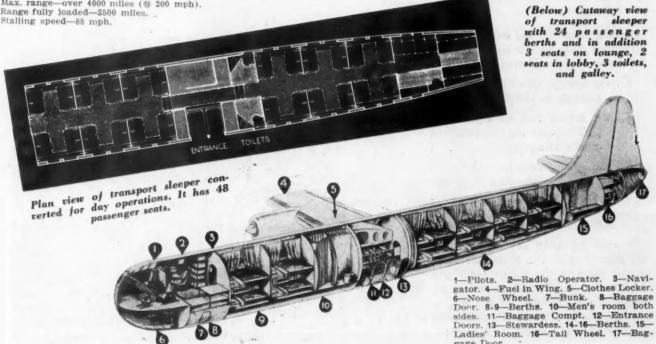
Max. range—over 4000 miles (@ 200 mph). Range fully loaded—2500 miles.





gage Door.

(Right) Club car arrangement of seats (back-toback) in the day transport.



May 1, 1944

Computing Load on Aircraft Engine Mount Rings

By M. S. Simms

Structures Engineer, Northrop Aircraft, Inc.

The following is a development of a general method for calculating loads imposed on the engine mount ring by an aircraft engine when the engine is mounted to the ring by several vibration absorbers placed around the circumference of the ring, giving what is known as "dynamic suspension." The expressions are equally applicable to either the Wright system of suspension, Fig. 1, or the Pratt and Whitney system, Fig. 2.

given by

 $F_t = K_t \Lambda V \sin \psi$

and the radial force

 $F_r = K_r \Lambda V \cos \psi$,

angle \(\psi \) being measured as shown in Fig. 3.

The vertical force on one mount, then, is the sum of the vertical components of the tangential and radial

force components, as follows:

 $K_r = K_p \sin^2 \phi + K_n \cos^2 \phi.$

Fig. 3 represents conditions at one mount in a vertical

plane through the mounts. $\triangle V$ is the vertical deflection due to a vertical force F. Since Force = Spring Rate x Deflection, the

tangential force set

up in one mount by the vertical load is

 $F_1 = K_t \Lambda V \sin^2 \psi_1 + K_r \Lambda V \cos^2 \psi_1$, and the total vertical force

 $F = AV [K_t \Sigma \sin^2 \psi + K_r \Sigma \cos^2 \psi],$ from which expression $\triangle V$ can be first calculated for a given vertical load F. Knowing $\triangle V$, F_t and F_r may then be computed for each mount.

In this manner the components of load due to a vertical load are computed. To these components are added those due to the torque reaction of the engine and the thrust, giving the total load on the mount ring at each mount.

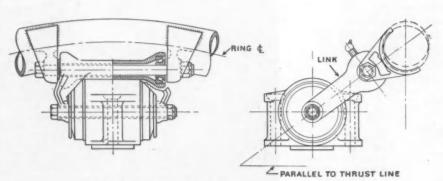


Fig. 1-"Wright" system of suspension

Spring rates for the mounts in the following three directions must be obtained from the manufacturer or determined by experiment:

K_t, the spring rate in a direction tangent to the mount ring.

K, the spring rate in a direction parallel with the line of action of the vibration absorber.

K_a, the spring rate in a direction normal to the line of action of the vibration absorber. This will be zero for the Wright type of mount.

It can be shown that spring rate K_r , measured in the radial direction in the plane of the mount ring, is a function of K_p , K_a and the angle between the thrust line of the engine and the line of action of the vibration absorber, Figs. 1 and 2, as follows:

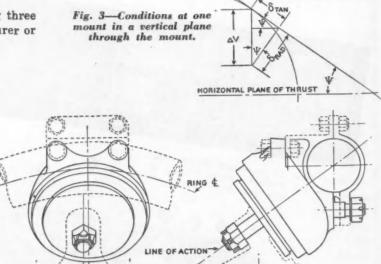


Fig. 2-"Pratt & Whitney" system of suspension

-PARALLEL TO THRUST LINE

MATCHING AN ACK-ACK FOR WIDE RANGE ACTION



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A simple adjustment sets the stroke at any length up to 18", and pressure can be pre-set at any point from 10 to 100 tons. Or, the operator can regulate the power and stroke "as he goes" with the pressure gage at his right showing tonnage changes pound-by-pound. Speed of operation can be varied as desired. Fixtures and tools can be changed readily. It's a fully enclosed press-high in safety factors.

The DLOS2-100 is available with either manual or electric controls, or both. Where complete safety is imperative, "two-hand" control can be provided. Maximum daylight opening is 36 inches. A similar model of 50-ton tive, or write us today.



RIES

Mew Production Equipment

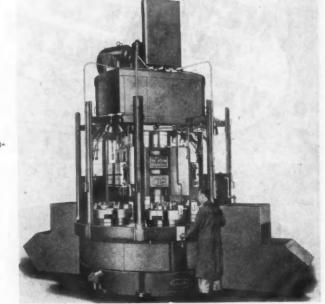
THE new MH-1 internal grinder, called the "Sav-Way Spitfire," announced by Sav-Way Industries, Detroit, is said to have basic characteristics of rapid action, flexibility, ease and convenience of operation, particularly for women operators, and facilities for quick, easy loading and unloading.

Outstanding features are the short table stroke—5/32 in. minimum—and the extremely rapid table feed and reverse. These are achieved through a combination of hydraulic operation and electric control. Solenoid operated valves and aircraft type micro-limit switches provide constant control and reduce time lag to a minimum. In addition, the machine is equipped for hand table feed, which is engaged by moving the hand wheel out to engage a rack and pinion.

It is available with either manual or electrically controlled power cross-feed. The electric cross-feed gives a cross-slide ratchet feed of 0.0001 in. per tooth, resulting in 0.0002 in. increase in the diameter of the hole.

The standard machine is equipped with a manually operated wheel-truing mechanism with cam return. However, it also is available with a semi-automatic diamond wheel dresser, electrically operated with automatic, adjustable, slow-down of table traverse while dressing the wheel.

Another feature is the Sav-Way Gold Seal Spindle, with unique selfventilating provision which provides



Bullard Mult-Au-Matic

for a constant flow of oil-air mist through the working parts of the spindle, and also keeps the spindle free from dirt and coolant. The spindle is driven by a three horsepower, 36,000 rpm, dynamically balanced, totally enclosed fan cooled ball bearing motor. The workhead spindle is driven by a half horsepower, 1140 rpm, dynamically balanced ball bearing motor, which is completely enclosed. Workhead spindle speeds of 90, 145, 235, and 365 rpm are

provided through an adjustable V-belt drive.

Neoprene pads inserted between the bed and base absorb vibration and prevent distortion. A number of fixtures have been developed to facilitate accurate loading and unloading.

THE new 34-in. Mult-Au-Matic is larger than any machine of its type heretofore built by The Bullard Company, Bridgeport, Conn. It is said to be the first planned production unit of its size for machining work up to 34 in. in diameter and up to 23 in. in length.

Six heads—two at each working station, each with independent feed mechanism, and each providing vertical, horizontal, or angular motion—make it possible to accomplish with three working stations what formerly required six working stations. All heads are counterweighted hydraulically with an adjustment to give more or less weighting.

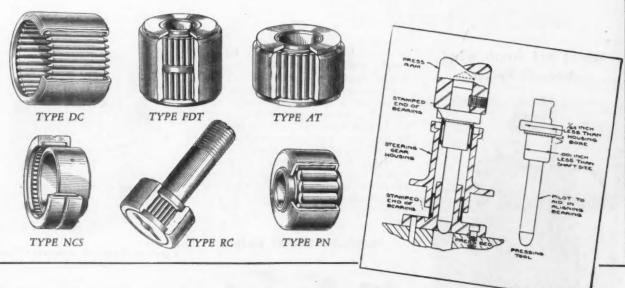
A specially designed indexing and locking mechanism gives smooth indexing and provides rigid positioning and locking of the carrier at the completion of the index. Push button control for actuation of the tool slides simplifies tooling operations. Forward or backward motions are obtainable. Hydraulic feed "kick-out" at each feed mechanism prevents carbide tool breakage when the machine is stopped in uncompleted cuts.

An adjustable column, carrying the tool heads permits moving up and down

AUTOMOTIVE and AVIATION INDUSTRIES

Sav-Way Spitfire internal grinder

All These Needle Bearings are Quickly and Easily Installed



UNIT CONSTRUCTION AND SIMPLICITY OF DESIGN FACILITATE ASSEMBLY LINE PRODUCTION METHODS

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One of the outstanding features of Torrington Needle Bearings is the ease and speed with which they are installed. Because of their unit construction, handling and assembly or dis-assembly of associated parts or mechanisms are simplified.

Furthermore, the compact design characteristic of these Torrington Needle Bearings makes possible the use of simpler housing structures. In virtually all cases a bore, machined to proper dimensions, is all that is required to hold the bearing. An arbor press (with properly designed pressing tool) is the only equipment necessary to secure correct installation in practically any application.

And properly installed, in correct press fit, Needle Bearings will not shift or creep-eliminating the need of locking-rings or spacers.

All these installation features contribute to speed and efficiency that result in cost economies on the production line. They are helping today in meeting production schedules; will

similarly aid "tomorrow's" postwar production lines.

It will pay you to investigate the many advantages of Needle Bearings in terms of your own design and production requirements. A copy of the Torrington Needle Bearing Catalog, available on request, will give you more complete information. Ask for Catalog And the services of our engineering department are available to aid you in the selection and application of Needle Bearings for any particular job.

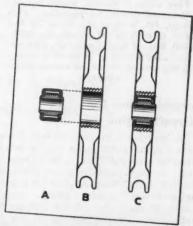
THE TORRINGTON COMPANY

Established 1866 . Torrington, Conn. . South Bend 21, Ind. "Makers of Needle Bearings and Needle Bearing Rollers" Boston New York

Detroit San Francisco Cleveland Los Angeles Chicago



A simple arbor press is the only equipment required to install Torrington Needle Bearings.



PN Type Torrington Needle Bearing is installed in aircraft pulley by simple press fit.

TORRINGTON NEEDLE BEARINGS

Mew Products for Aircraft

Model 911 South Wind Aircraft Heater



This aircraft heater, made by the Stewart-Warner Corporation, Chicago, Ill., weighs less than 25 lbs, and is capable of producing 200,-000 Btu of heat per hour. The entire production at present is going to the armed forces for use on large aircraft.

Portable Filter for Aircraft Engine Oil

An innovation in the filtering of aircraft engine lubricating oil is introduced by General Filters, Inc., Detroit, Mich., in their portable model AF-1400 filtering unit. The unit includes a gasengine-driven rotary pump, which draws oil from the engine through a suction hose attached to the oil supply tank. Oil is circulated through six full-flow filters—mounted 2 in series and 3

in parallel—and returned to the oil supply tank. A metal box houses two 20-foot lengths of oil-resisting hose.

Filtration is said to be positive to a fineness of 5 microns. Each filter cartridge has an area of 1000 sq. in., and can be cleaned several times in gasoline or kerosene. Two pressure gages, one on the inlet, and one on the outlet side of the filters, indicate when filter cartridges should be cleaned or changed. The filters are full flow, with a by-pass valve which opens at 15 lbs.

Molded Aircraft Bolts



These plastic bolts, a product of Windman Brothers, Los Angeles, Cal., are made of Monsanto Chemical Company's cord-filled Resinox. North American Aviation, Inc., is using similar bolts in hoist tie-down and mooring fittings.

New Electrical Connector

Newest Cannon electrical connector in the Army-Navy Specifications line is the type known as AN3101, according to the proposed AN-W-C-591a specifications. Although in general appearance this new type looks like a plug, it has been designated as a "recep-



Cannon electrical connector Type AN3101

tacle" inasmuch as it has a male coupling thread similar to Types AN3100 and AN3102.

AN3101 is a mating cord connector for AN3106 and AN3108. Since it has no mounting facilities such as the flange on Types AN3100 and AN3102, it may be used in place of an AN3100 or AN3102 when regular mounting is not necessary. Also adaptable for use with an extension cord.

All standard Cannon parts are used in conjunction with a special barrel. Shell material is aluminum alloy, with sand blast and clear lacquer finish.

The Cannon Electric Development Company, Los Angeles, Cal., offers the new receptacle in sizes 8s to 16s, and 12 to 36 (incl.). All tooled Cannon insert arrangements are adaptable and interchangeable in Cannon Type AN-3101.

New Technique Improves Synthetic Rubber

A synthetic rubber development that will improve the bullet-sealing qualities of gasoline fuel and oil tanks used on airplanes, that will facilitate tire production, and that will conserve the limited supply of natural rubber has been developed by The Firestone Tire and Rubber Company, Akron, Ohio,

This special technique produces a modified rubber, a small amount of which, when mixed with a large amount of synthetic rubber, is said to give the needed quality of cohesion or tackiness. In line with its war-time policy Firestone has made this new process available to the industry.



Model AF-1400 filtering unit

How this DIAGRAM can help you...



Turn Idle Machine Time Into Extra Plant Output

If someone offered you a tried and proved method for selecting the right tool steel for each job—and told you how to simplify heat treatment and get better tools—you would probably hire him on the spot.

And that is just how the Carpenter Matched Set Method of selecting tool steel can be put to work in your plant.

In hundreds of plants, this tried and proved method is leading the way to tools that stay on their jobs longer, keeping machines operating more hours per month. It is reducing the number of times that tools must be reground, repaired and replaced. And simplified heat treating methods help you protect the hours that have gone into tool making.

To find out how you can put the Matched Set Method to work in your tool room, ask for your copy of the Carpenter Matched Tool Steel Manual shown here. It will point the way to better tools that can increase output from machines and presses. For your copy, drop us a line on your company letterhead.

THE CARPENTER STEEL COMPANY - 103 W. Bern Street, Reading, Pa.



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Here's your key to:

- · saving time and steel in the tool room
- · getting better heat treating results
- · increasing production per month per press

In this 167-page Matched Tool Steel Manual you will find an alphabetical Tool Index and Steel Selector. At a glance, it quickly points the way to selecting the right tool steel for each job. Whether you need an oil-hardening, water-hardening or red-hard tool steel for the job, this Manual provides a definite system for arriving at the correct answer. And from there, it is a simple matter to follow the complete heat treating instructions.

The Matched Tool Steel Manual is offered free to tool steel users in the U. S. A., so for your copy write us a note on your company letterhead today.





One-Piece Hose Clamp

Tinnerman Products, Inc., Cleveland, Ohio, is offering a one-piece hose clamp which may be snapped over the hose into pre-latched position by hand, and tightened by hand pressure on ordinary pliers. The new clamp, which is made for low pressure connections, is light in



Tinnerman one-piece hose clamp

weight and exerts an even pressure around the entire circumference of the hose. It is made of S.A.E. 1060 spring steel with Parkerized and zinc chromate primer finish. Being a one-piece clamp, it reduces weight and assembly time. Available for all sizes of AN and Ordnance specification hose ½ in. OD and larger.

Large Portable Heater

A portable heater which has an output rating of 250,000 Btu per hour, and which can be used in many applications, is announced by Surface Combustion, Toledo, Ohio. The new portable heater uses liquid fuel and will operate on any grade of gasoline. Kerosene may also be used and, with minor modifications, the unit will operate on other liquid fuels.

Equipped with gasoline-engine or electric-motor drive, and mounted on a two-wheeled carriage, the unit can be moved in wheel-barrow fashion or can be pulled sled-fashion over snow, ice or mud. Draw and push bars, as well as lift bars, are incorporated into the frame. The center of gravity is di-

rectly over the wheels when the unit is lifted to the most convenient position for hand wheeling.

Easily Formed Laminated Thermosetting Sheet

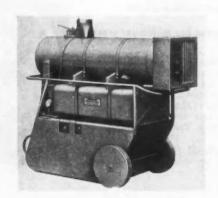
Panelyte Grade 906 is a newly developed post-forming material which is supplied by Panelyte Division of St. Regis Paper Co., New York, N. Y., as a fully cured laminated thermosetting sheet which can be stamped, bent, and drawn in a process similar to that used in metal stamping. However, the processing is somewhat simplified over metal working in that molds of Kirksite, cast phenolic, laminated phenolic, or wood may be used.

The working of the sheet is accomplished by heating the material to temperatures higher than those used in manufacture. It is not necessary to use hot molds, but merely to heat the material, mold it, and leave it for a very short period in the mold for partial cooling.

Laminated phenolic parts having compound curvatures and fairly sharp bends can be made from Grade 906. Bends having an inside radius of the thickness of the material are said to be very practical. High pressures are not required. Small air cylinders are very suitable, and in some cases, even hand presses will suffice.

Aromatic-Proof Hose Assemblies

Resistoflex Corporation, Belleville, N. J., is introducing a special line of hose assemblies that are immune to the action of aromatics in high concentrations. The hose itself contains a core



Portable multi-service heater



Resistoflex Compar hose assemblies

made of specially compounded compar—a rubber-like vinyl plastic developed by Resistoflex.

This core does not swell, break down or slough under the action of lubricating oils or fuels containing the highest percentage of aromatics. This combination of properties has resulted in the successful application of Resistoflex compar hose assemblies for fuel, oil, instrument and hydraulic lines in aircraft, gasoline and Diesel powered trucks, refrigeration equipment, and hydraulically operated machine tools. Resistoflex hose has been approved by the Army, Navy, and C.A.A.

Solid Tires of High Conductivity Compound

Industrial solid tires of high conductivity compound, used on equipment in plants manufacturing gunpowder and other highly combustible materials, are now being made of synthetic rubber by United States Rubber Company, New York, N. Y.

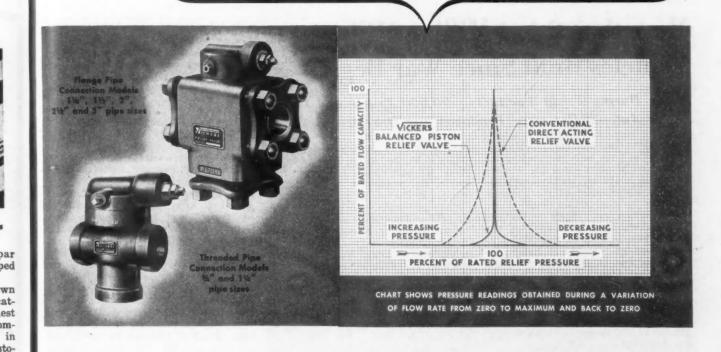
With constant flexing in service of any high conductive rubber tending to decrease its conductivity, a direct tire-to-tire comparison is said to have revealed that when operating under similar conditions the synthetic rubber tires are equal to, or better than, the same type of tires made previously from natural rubber. As industrial equipment often builds up static electricity which cannot be dissipated by regular tires, high conductor tires are so compounded that they will dissipate the charge harmlessly before a spark is created.

Electric Manometer

The Electric Manometer, manufactured by Trimount Instrument Com-(Turn to page 70, please)

MORE ACCURATE

HYDRAULIC PRESSURE CONTROL



VICKERS

Balanced Piston Type

RELIEF VALVES

As indicated by the chart above, Vickers Balanced Piston Type Relief Valves have a negligible pressure variation throughout their capacity range. In these valves a hydraulically loaded and balanced piston takes the place of the customary spring-loaded directacting relief mechanism. This means more sensitive operation as well as greater accuracy throughout the wide pressure range.

This accuracy of control prevents pressure override when sudden changes in pressure occur in the hydraulic system. Compact design, longer operating life, installation directly in the pressure line, quiet operation, and simple adjustment are other advantages of these Vickers Balanced Piston Relief Valves. See Bulletin 38-3 for complete information.

Vickers Application Engineers will gladly discuss with you how Vickers Hydromotive Controls can be used to your advantage.

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1428 OAKMAN BLVD. • DETROIT 32, MICHIGAN Application Engineering Offices: CHICAGO • CLEVELAND • DETROIT • LOS ANGELES NEWARK • PHILADELPHIA • ROCHESTER • ROCKFORD • TULSA • WORCESTER

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function



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CONSTANT DELIVERY



FLUID



DIRECTIONAL



VOLUME



PRESSURE



CONTRO



VARIABLE DELIVERY PUMPS

More than 2 1/4 Million Military Vehicles Built Since War Began

During World War I, Only 90,000 Trucks and 18,000 Automobiles were Produced for Our Armed Forces

More than two and one-quarter million vehicles have been produced by the automotive industry since the present war began in 1939. This illustrates the complete motorization of the army in this war in comparison with World War I, which saw 90,000 trucks and 18,000 automobiles produced for the U. S. armed services in the 19 months of that conflict. The U.S. Army purchased its first automobile in 1903 and bought four more in 1906. The first military truck was put into service in 1907. The value of motorized military equipment was demonstrated by the Mexican uprising in 1916, so the U.S. entered World War I with 3,039 military trucks and 437 automobiles.

In the present war, the Dodge Division of Chrysler Corp. alone has manufactured more than 300,000 military trucks. Current production embraces four basic types, either 4x4s or 6x6s. Willys-Overland Motors, Inc., has turned out over 200,000 of the 4-ton all-purpose jeeps. Ford Motor Co. of Canada made 79,602 automotive units in 1943 for Canadian and other British Empire troops. This is somewhat less than the 111,839 military vehicles produced in 1942 but concentration on specialized types of vehicles accounts for the lesser number. Ford Motor Co. in the U.S. has produced more than 6,000 armored cars of the M-8 and M-20 Ford also has delivered to the armed forces 173,737 land jeeps, 12,778 amphibian jeeps, 38,095 military cargo trucks, and 3,743 bomb service trucks for the Army Air Forces. In addition, Ford has delivered 1,690 M-4 medium tanks, 1,038 tank destroyers and 7,282 500-hp tank engines.

Many vehicles, especially Studebaker 6x6 military trucks and Willys-made jeeps, have been shipped to Russia under lend-lease. More than 190,000 trucks, 36,000 jeeps and nearly 30,000 other military vehicles had been sent to the Soviet Union up to March 1.

Emphasis on amphibious warfare is evidenced in the increasing output of equipment for invasion purposes. Graham-Paige Motors Corp. produced nine times as many Water Buffalo amphibian tractors in the first quarter of 1944 as in the same period of 1943. In-

creasing space in its Detroit plant made available by the Army Air Forces enabled Graham-Paige to more than double its production of amphibian tractors in the closing months of 1943. Volume of output, which also includes aircraft and marine engine parts and torpedo parts, increased 64 per cent from \$12,804,966 in 1942 to \$21,061,318 in 1943. The latest Navy appropriation bill for 1944-45, recently before Congress, calls for 30,151 ships other than combat vessels, the greater percentage of which are landing craft. Donald Nelson, chairman of WPB, recently called for a 10 per cent step-up in output of landing craft. He said an outstanding job had been done since November in the construction of these craft, the original program for which

called for 80,000 units. The automotive industry supplies a majority of the Diesel engines that go into landing craft, General Motors Corp. alone furnishing 71 per cent of the Diesel power units that are installed in the four major types of craft used in amphibious operations.

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The Ford Willow Run Bomber Plant finally has achieved its production goal of a B-24 bomber every hour that the final assembly line is in operation. Total output is now well above the 3,000 mark, of which more than 2,000 have been flyaway deliveries from the adjacent airport. The rest are shipped as knocked down sub-assemblies to the Southwest. Two thousand bombers have been turned out in the last eight months. Ford delivered its first B-24 to the Army Air Forces in November, 1942. By January, 1943, only 10 more had been built but production had rapidly accelerated since that time. February production was more than double that of last July and the plant has been ahead of schedule for seven consecutive months. The plant is working two nine-hour shifts six days a

(Turn to page 68, please)

Remember Ward of Chicago

Though the President is commanderin-chief, Congress is his Commander; and, God willing, he shall obey. He and his minions shall learn that this is not a government of kings and satraps, but a government of the people, and that Congress is the people.

—Thaddeus Stevens





The world's largest magnesium sheet and strip mill has recently gone into production.



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Synthetic sapphires and rubies for the jeweled bearings of instruments and for spray nozzles, gages and spinnerets cost from three to six cents per carat while diamonds for this purpose cost about three dollars per carat. The making of these is an American war baby with a future.



NE alloys now make up as much as 20% of the tonnage of steel for aircraft.



A way has been found to put the "flags" (characteristic of natural bristles) on the ends of synthetic bristles for use in paint brushes.



The American chemical industry promises that it will employ more workers after the war than it did before.



Bituminous Coal Research, Inc., supported by the industry, has announced a \$2,500,000 program, covering five years, with improvement in the use of soft coal as its object.



Dip-painted parts are being passed through an electrical field which removes the "tear-drop" in which the excess paint collects.



Electronic traffic control may replace the familiar signs and lights by signalling the driver through his dash radio.



The strongest natural fiber is Ramie, cultivated in Egypt 4,000 years ago. It is now being grown in this country and, if practical processing methods can be devised, it is expected to appear among our new textiles.



The new Orthicon camera has an "eye" composed of 400,000 pieces of light-sensitive silver which store voltage proportional to the light cast on them. It will be used in television and is said to be ten times as efficient as the iconoscope previously used.

Photo-electric cells check hand grenades at the rate of 4,000 per hour. When a defective unit appears on the conveyor, the mechanism rings a bell, lights a lamp, puts a dab of paint on the grenade, and makes a mark on a chart.

A new process for drying the paint on army tanks does the work in four minutes while the operator drives the tank through the "oven."



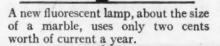
The use of the thyratron tube as a rectifier makes possible the use of an A. C. current supply to drive D. C. motors, the advantage being in very exact control of speed.



Extremes of temperatures encountered in flying have made necessary the development of new and better cements to replace the Canada balsam formerly used in the making of lenses.

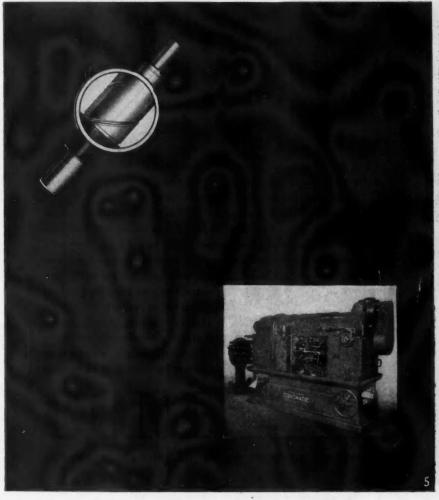
The cost of Diesel-produced electric power is expected to be cut in half as the result of war-time developments.

Street cars designed for post-war production will be lighter, quieter, better looking, and more economical in operation. They will have more comfortable seats and the windows will be higher to give strap hangers a better view.



A new electronic method of sorting metals detects differences in material, alloys, heat treatment and thickness.

Success of the "bazooka" against enemy tanks has called public attention again to the rocket or reaction engine as a source of power. Such a motor has been constructed, for experimental use, that develops 260 horsepower for each pound of its weight. One horsepower per pound is the approximate output of the lightest internal combustion engines.



RIES

Committee Studies Possible **Production of Cars for Civilians**

C. E. Wilson Proposes Annual Output of 2,000,000 Cars, Small Companies Object to Limit of 50% of 1941 Volume

Passenger car manufacturers are studying the practical minimum number of vehicles that can be made under limited schedules, without seriously affecting unit cost, when partial production of civilian models is permitted by the War Production Board. At the first meeting of the new WPB Auto-

mobile Industry Advisory Committee April 17 in Washington, WPB officials announced it was agreed that no passenger car production will begin until either the German or the Japanese phase of the war is completed. Volume production is not considered feasible

return to Washington in 60 to 90 days with specific details on the amount of machine tools and factory floor area that will be needed, what Governmentowned machines and equipment must be removed, and what percentage of Government-owned tools and machines can be used in civilian automobile production. At its next meeting the committee is expected to name its own subcommittee that will work out a practical formula for reconversion. The company executives have been instructed until after the war ends. to consider plans for both limited production and unrestricted production of passenger cars.

C. E. Wilson, president of General Motors, proposed that an annual output of 2,000,000 cars was the minimum production at which the plants could be operated economically. Some of the smaller companies are known to object to resuming production on the basis of 50 per cent of 1941 output of 3,744,000 cars, maintaining that their small quotas would be economically unfeasible and they should not be asked to lose money in order to stay in business. Also, it was pointed out that the Packard and Nash plants are so bound up with war contracts that any immediate resumption of passenger car production would be impossible for these two companies. Packard is making Rolls-Royce and PT boat engines, and Nash is making Pratt and Whitney airplane engines. Both companies have little or no available idle capacity, and manpower in their respective areas is very tight. Nash expects to get increased war work with the award of contracts for the new C-type Pratt and Whitney engine, which involves new tooling to produce an engine that is said to develop about 2600 hp.

The committee members, representing nine passenger car companies, will

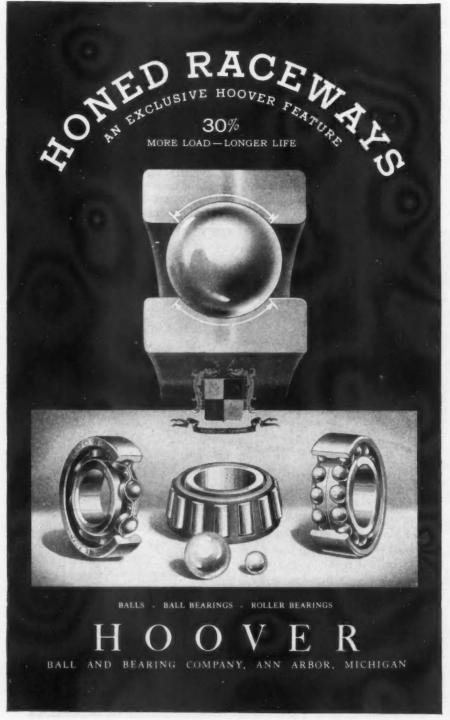
Among the questions likely to be discussed at the next meeting with WPB will be whether the first postwar cars will be limited to 1942 models and whether new manufacturers will be al-

(Turn to page 64, please)

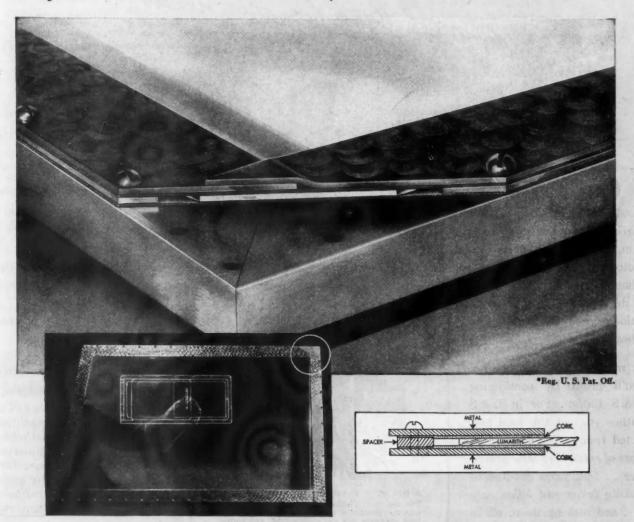
Labor Advisory Committee On Industry Conversion

According to an announcement of the War Production Board, Donald Nelson, Chairman, has appointed an advisory committee of labor union representatives in connection with the formulation of plans for reconversion of the automobile industry. The membership of the committee is as follows:

R. J. Thomas, Detroit, international president C.I.O.-United Automobile, Aircraft and Agricultural Implement Workers of America; George F. Addes, Detroit, international secretary-treasurer C.I.O.-U.A.W.; William C. Stevenson, Detroit, executive board member C.I.O.-U.A.W.; Richard E. Reisinger, Cleveland, executive board member C.I.O.-U.A.W.; Lester Washburn, Milwaukee, president A.F.L. - International United Automobile Workers; Frank Fenton, Washington, A.F.L. director of organiza-R. J. Thomas, Detroit, international pres-Washington, A.F.L. director of organiza-tion; Walter Reuther, Detroit, international vice-president C.I.O.-U.A.W.; Richard T. Frankenstein, Detroit, international vice-president C.I.O.-U.A.W.



This FULL-FLOATING WINDOW MOUNTING of Aero-Quality LUMARITH*



Is Considered Ideal by Many Engineers

The full-floating type mounting, here illustrated, has many advantages to recommend its use for cellulose acetate plastic panel mountings. It eliminates the drilling of bolt holes, and the attendant difficulties of locating them properly. Replacements are easier to make.

Depth of channel is determined by taking into consideration the maximum possible expansion and contraction of the Lumarith panel, and the channel support depth required under all atmospheric conditions. Spacer thickness, which is important, is gauged

so as to insure a firm grip of the panel and yet permit expansion and contraction movement.

The Technical Service Department of Celanese is ready at all times to give assistance to manufacturers on the subject of plastics—either molded or sheets, rods, tubes, films or foils. You'll want, of course, a copy of the second edition of the Lumarith Mounting Book. Let us know where to send it. Celanese Celluloid Corporation, The First Name in Plastics, a division of Celanese Corporation of America, 180 Madison Avenue, New York City 16.

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"It was worth our time looking the leading lather over. We finally chose L+S, because it proved best for our needs"

ON one point or another, a good word can be said for most lathes on the market today. The way to lasting satisfaction, however, lies in consideration of all factors of lathe value. Our suggestion is: measure what you get in different makes . . . compare points of design, new improvements, flexibility, etc., in relation to production, costs, and all-over efficiency.

In making such comparisons, you'll profit by considering L & S Lathes. For in L & S Lathes you get the final perfected result of 52 continuous years of specialized lathe experience . . . 52 years devoted to making lathes and lathes only . . . and making them, all in



This vast fund of accumulated lathe experience can help perfect your production, whether your plant is large or small. Call on Lodge & Shipley engineers...

they'll gladly show you what can be done.

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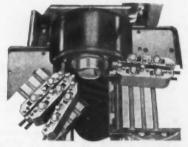
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Prepare for the Coming BATTLE OF MARKETS!

Your peacetime products will be on their own against competition keener than ever before. Call on Lodge & Shipley engineering and manufacturing experience to help you plan now for quick conversion when and as conditions warrant. Don't be caught napping!

Engine—Automatic—Tool Room—Oil Country Lathes



A BIG STEP FORWARD IN LATHE DESIGN The No. 3-A Duomatic Lathe is designed for quantity production in a wide range of cycles. Dual carriages and tool slides—front and rearpermit more advantageous use of multiple tools in turning, and straight and angular operations. Illustration shows three tools front and two tools rear, arranged in universal tool holders for machining thrust bearing cage. Write for Bulletin 601-FL.

THE ODGE & OHIPLEY MACHINE TOOL CO.

CINCINNATI, 25, OHIO, U.S.A.



Civilian Truck Output Ahead of Schedule

Civilian truck production in the first quarter of 1944 was 13 per cent ahead of schedule. A total of 10,329 medium and heavy trucks were manufactured for civilian use compared with schedules calling for 9,157 units. The first quarter output consisted of 7,128 medium trucks and 3,201 heavy vehicles, according to John H. Middlekamp, director of the Automotive Division of WPB. Military and civilian output combined for the first three months was 100.4 per cent of schedules.

Middlekamp pointed out that the first quarter goals were reached despite shortages in ball bearings, axles, transmissions and other components. He said that progressively higher quotas have been set for remaining quarters of 1944 and manpower will be an important factor in deciding whether these goals will be reached.

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New Method of Fuel Supply for Engines

Gasoline injection, a new method of supplying fuel to the cylinders of gasoline engines, has been developed by the American Bosch Corporation, and is now in production at the Bosch plant in Springfield, Mass. According to Donald P. Hess, president of the Corporation, higher efficiency, even with lower-grade gasolines, greater responsiveness, smoother power delivery and elimination of the fire hazard of an explosive mixture of gasoline and air in the induction system, are some of the advantages of the new fuel distribution system.

CALENDAR

Conventions and Meetings

SAE Natl. Diesel-Fuels & Lubricants Meeting, Chicago May 17-18

SAE Natl. War-Materiel Meeting, Detroit June 5-7

Automotive Engine Rebuilders Assoc., Cincinnati June 13-15

American Society for Testing Materials (47th Annual Meeting), New York City June 26-30

SAE Natl. Transportation & Maintenance Meeting, Philadelphia June 28-29

SAE Natl. West Coast Transportation & Maintenance Meeting, Portland, Oregon August 24-25

SAE Natl. Tractor Meeting, Milwaukee Sept. 13-15

SAE Natl. Aircraft Eng. & Production Mtg., Los Angeles Oct. 5-7

SAE Natl. Fuels & Lubricants Mtg., Tulsa Nov. 9-10

American Chemical Society Natl. Chemical Exp., Chicago.....Nov. 15-19

SAE Natl. Air Cargo Mtg., Chicago, Dec. 4-6

SAE Annual Meeting, Detroit Jan. 8-12

Precision AIRCRAFT fastenings HOLTITE Aircraft Screws, Bolts and Nuts are scientifically designed, produced and inspected to meet the most rigid A N and A C specifications. Adopted by the Aircraft Industry for use in every part of America's fighting and transport planes these precise, rugged fastenings are skilfully made

scientifically designed, produced and inspected to meet the most rigid A N and A C specifications. Adopted by the Aircraft Industry for use in every part of America's fighting and transport planes these precise, rugged fastenings are skilfully made of selected, pre-tested materials. HOLTITE Aircraft Fastenings are accurately gauged and inspected at each stage of manufacture by specially trained inspectors. Heat treating, plating and other finishes are in strict accordance with A N and A C specifications.

HOLTITE "Thread-Forming" SHEET METAL SCREWS

When Speed Nuts are used with HOLTITE Sheet Metal Screws, the small, tapered point permits a quicker start and run-on of nut. The smooth threads with faster lead reduce nut-turning time and provide a much tighter lock to resist vibration.

Cutting their own threads—in metal or plastics as they are driven in, these production-boosting screws eliminate time-consuming tapping operations and effect a stronger, tighter fastening as each thread stays tight in the perfect mating thread it has cut in the material. Available with slotted head or HOLTITE Recessed Head.

CONTINENTAL SCREW CO. New Bedford, Mass., U.S.A. SCREW CO. BUY MORE WAR BONDS

Packard Engine Output Equal to 370,000 Cars

Packard's war engine output for March equalled a peacetime schedule of 50,000 cars in dollar value, George T. Christopher, president and general manager told a meeting of 100 car dealers, parts managers and dealers' service men April 19 in Philadelphia. Since the start of the war Packard, which makes Rolls-Royce aircraft engines and PT boat engines, has shipped nearly 35,000 engines to the Allied forces, representing 47 million rated horsepower and is the equivalent of

the total power installed in approximately 370,000 Packard cars. Christopher stated that new buildings in Detroit and Toledo, together with the original factory, now provide Packard with a total of 4,600,000 sq. ft. of protive plant area. Redesigning of plant layout, already completed, and more efficient handling of materials should permit a 44 per cent increase in capacity for making Packard cars after the war.

Packard's postwar car will resemble the 1942 Clipper "with a face lifting job" and present indications point to prices roughly 25 per cent higher, he

PUBLICATIONS

Spencer Turbine Co. has issued a new bulletin describing the Spencer Sump-Vac, a new portable vacuum producer. Briefly described are applications of Spencer industrial vacuum cleaners and turbe-compressors.*

Many carbide-tipped cutting tools gener-Many carriage-ripped cutting tools generally classified as special are now listed as standard in the new Catalog No. 144 of Wendt-Sonis Co. These include spiral reamers, jobber reamers, stub taper spot facers and counterbores, side milling cutters, boring tools, etc.*

Physicists Research Co. has issued the econd edition of its booklet Practical Surface Roughness Measurement, which contains information on surface roughness and its measurement and describes the complete line of Profilometer roughness-gaging equipment.*

A revised edition of a technical bulletin entitled Zamak Alloys for Zinc Alloy Die Castings has been issued by The New Jersey Zinc Co. It describes the Zamak series, outlines the physical and mechanical properties as cast, touches on aging, inspection control, corrosion resistance, finishing and machining.*

Sciaky Bros. has issued a four-page bulletin describing the Sciaky Locating Spot-light, which has proven useful on a wide range of production machinery.*

King Bros. Engineering Works has is-sued an 8-page illustrated bulletin describ-

ing Kling Rotary Shears.*

A folder, New Developments in Aircraft Welding, has been issued by Eutectic Welding Alloys Co., describing and illustrating its low temperature welding.*

Watson-Stillman Co. has issued three new folders, as follows: No. 370-A on general purpose hydraulic presses, suitable for diversified utility work in the metal-forming ceramic or plastic industries. No. 621-A on horizontal injection molding machines, giving specifications covering five models with ing specifications covering five models, with hopper feed capacities, detailed drawings and complete data on operating features. No. 622-A describing the operating features and listing specifications of its new 2 and 4-oz. vertical injection molding machines.*

4-oz. vertical injection molding machines.*
A new folder published by the Muehlhausen Spring Corp. illustrates and describes how large springs are hot-coiled. It shows in sequence the steps in manufacturing large springs, facilities necessary and operations required to fabricate these springs in quantity and hold to the tolerances demanded by the application of the spring.*
National Broach and Machine Co. has issued a new booklet on its Red Wing Universal Gear Checker, a simple, rapid and accurate machine for checking gear dimensions.*

Arc Welding In the Maintenance and

Arc Welding In the Maintenance and Construction of Tools and Dies is the title of a new handbook of engineering data, welding procedures and heat treatment procedures for tool and die steels, issued by C. E. Phillips and Co.*

Highlights of the principles, construction and engineering advantages of Spring-Life Bellows are given in a new catalog issued by the Cook Electric Co.*

American Broach and Machine Co. has issued a new booklet on broach pulls and heads, describing and illustrating the various types and including tables of specifications for each model.*

G. S. Blakeslee & Co. has issued a new catalog on solvent vapor degreasers which describes its degreasing process for cleaning of parts of all metals and alloys. Chapters are devoted to design and construction, applications and advantages, special applications, etc.*

*Obtainable by subscribers within the United States through Editorial Dept. AUTOMOTIVE and AVIATION INDUSTRIES. In making requests for any of these publications, be sure to give date of the issue in which the announcement appeared, your name and address. company connection and ittle.



 The two factors which account for industry's wide acceptance of Western Felt are:

1. Engineering Experience. A full staff of experienced engineers have designed the prefabricated shapes that are being so widely used today. They are prepared to assist any manufacturer in determining specifications for felt as an alternate.

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Felt is:

· Water, heat and

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Used for:

Weatherstripping

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· Flexible

· Resilient

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Gaskets

Washers

· Pads

Enclosed Design

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.. PROTECTS LATHE OPERATOR

.. KEEPS VITAL PARTS CLEAN

.. MAKES BELT CHANGING EASY

The operator does not catch fingers or clothing in moving belts or gears on a Logan Lathe. The Cone Pulley Guard in its normal "down" position completely covers the countershaft, headstock and back gear assemblies. The motor-drive belt and change gear assemblies are completely enclosed. All guards are quickly and easily opened giving complete accessibility. Not only is the operator protected, but vital parts of the lathe are shielded from dust and dirt accumulations.

Raised to its "up" position, the Cone Pulley Guard automatically moves the countershaft toward the headstock, releases flat belt tension, and makes changing the belt position easy and safe...an exclusive, patented Logan feature. The flat belt tension is easily and quickly regulated by a simple screw adjustment. Full information on all the advanced design features of all models of Logan Lathes will gladly be sent you on request. Write today for your copy of the latest Logan Lathe catalogs.

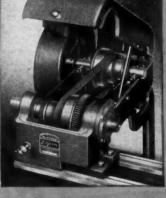


OPERATOR PROTECTED ... VITAL PARTS KEPT CLEAN

Countershaft, back gears, headstock, change gears and motor-drive belt are all completely enclosed, yet quickly accessible.

BELT CHANGES EASY AND SAFE

Raising the Cone Pulley Guard to "Up" position automatically moves the countershaft toward the headstock, releasing tension on the flat belt.





Swing over bed, $101/2^{\prime\prime}$. . . bed length, $431/4^{\prime\prime}$. . . spindle hole, $25/62^{\prime\prime}$. . . capacity, $5/6^{\prime\prime}$ with push type collet . . . 6-position automatic indexing turret . . . stroke of turret, $41/4^{\prime\prime}$. . . 12 spindle speeds from 30 to 1450 r.p.m. . . . all moving parts protected by ball bearings or self lubricating bronze bearings.

No. 850 MANUFACTURING TURRET LATHE



LOGAN ENGINEERING CO

CHICAGO 30, ILLINOIS

One of a series describing the finer features of Logan Lathes . . . Look for the next of the series



LOW TEMPERATURE WELDING EUTECTIC WELDING ALLOYS COMPANY 40 Worth Street New York 13, N. Y. EUTECTIC WELDING ALLOYS COMPANY 40 Worth St., New York 13, N. Y. GET IT FREE Please send me The EUTECTIC WELDER every month. Mail Name. Coupon Position. Company... Today City Address... *Rog. U. S. Pat. Off.

Advertising Notes

Three members of the Chicago office of J. Walter Thompson have been elected vice-presidents of the company.

They are Harry T. Mitchell, account representative; Frederick W. Boulton, executive art director, and George C. Reeves, manager of creative production. Also elected vice-presidents are Paul Berdanier, Jr. and Arthur T. Blom. quist, art directors, and Ruth Waldo,

editorial, of the New York office.

L. O. Lemon has been elected comptroller of the J. Walter Thompson

E. J. Reeser, formerly sales promotion manager of the Nash Motors Division of Nash-Kelvinator Corp., has been appointed associate account executive on the Electric Auto-Lite Co. account for Ruthrauff & Ryan, Inc. in the Detroit office. Robert L. Perry, formerly business and automotive editor of the Detroit Free Press, has joined the agency as assistant to M. J. Casey, vice president and manager of the Detroit

Anthony G. de Lorenzo, formerly Michigan manager of the United Press Association, has joined Arthur Kudner, Inc., in charge of public relations on the Fisher Body account, succeeding Frank Armstrong, who has been transferred to the New York office.



Awards

ELGIN MACHINE WORKS, Elgin, Ill. EVANS PRODUCTS COMPANY, Plant No.

1. Detroit, Mich.

FORD MOTOR COMPANY, Ypsilanti
Plant, Ypsilanti, Mich.

THE GENERAL INDUSTRIES COMPANY, Elyria, Ohio.

LITTLEFUSE, INCORPORATED, Chicago,

RAY-O-VAC COMPANY, Blake Manufac-turing Company, Clinton, Mass.

"E" Star Awards

for continued meritorious services on the production front have been awarded to the following firms:

THE ARO EQUIPMENT CORPORATION. Cleveland Plant, Cleveland, Ohio. BRIGGS CLARIFIER COMPANY, Washington, D. C.

CONTINENTAL RUBBER WORKS, Erie,



Maybe your stockroom isn't this bare...but the situation is tough and we are helping.

By keeping adequate stocks in the hands of 38 NAPA warehouses and at jobbers everywhere . . . so that when you need American Brakeblok brake lining materials in a hurry you can get them.

Naturally, the needs of the fighting men come first . . . they won't be let down. Thanks to a centrally located up-to-theminute plant and a resourceful research division, stocks for vital civilian motor transportation will be maintained.



BRAKEBLOK DIVISION, DETROIT 9, MICHIGAN

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Obituary

Forrest M. Keeton, 70, one of the early automobile manufacturers, died suddenly April 1 at his home in Detroit. He was sales manager of the Pope-Toledo Automobile Co. in 1903 and three years later organized the Croxton-Keeton Motor Car Co. at Massillon, Ohio, which produced the Croxton-Keeton car.

Richard L. Doyle, 64, assistant sales manager of the General Motors Truck Division of GM, died April 7 at Pontiac, Mich., after a short illness. He became associated with the Rapid Motor Vehicle Co. of Pontiac in 1911 and subsequently represented GMC Truck Co. in Kansas City before returning to Pontiac with that company in 1922.

Gilbert V. Egan, 52, treasurer and assistant secretary of Nash-Kelvinator Corp., died suddenly April 7 at his home in Detroit. He was treasurer of Commercial Credit Trust, Chicago, for three years until 1927, when he joined the Kelvinator Corp. as assistant treasurer. He was elected treasurer of Nash-Kelvinator in 1939 following the merger with Nash Motors.

Theodore G. Joslin, 54, Director of Public Relations, E. I. du Pont de Nemours & Co., and secretary to President Hoover during his term in the White House, died at Wilmington, Del., April 12 after a heart attack.

Clement O. Miniger, 69, chairman of the board of the Electric Auto-Lite Co. and a director of several other companies, including Bendix Aviation Corp., died April 23 at his home in Toledo, Ohio. Electric Auto-Lite was organized by him in 1911 and he served as president until a few years ago when he retired due to poor health. In 1929 he was president of Willys-Overland Motors, Inc.

Frederick R. Simms, 81, inventor and founder of the Royal Automobile Club, died April 22, according to a dispatch from London. He is credited with being the first man to drive a motor car in Great Britain and was a co-patentee of the first magneto in that country.





is one of the best supports of present service that must be prolonged. New Littelfuses mean prevention of short circuits, costly burnouts, and damage by inexperienced operators.

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Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for Auto-MOTIVE AND AVIATION INDUSTRIES

Relatively stable levels of general business activity have followed a considerable decline in February and early March. The seasonally adjusted early March. The seasonally adjusted index of *The New York Times* for the week ended April 8 stood at 143.8, four fractional points below the figure for the preceding week, as against

139.1 a year ago. Railway freight loadings during the week ended April 8 totaled 789,324 cars, 0.2 per cent more than the preceding weekly number and virtually equal to the comparable figure in 1943.

equal to the comparable figure in 1943.

Production of electric power during the same period declined more than seasonally; and the total was 12.3 per cent above the output a year ago, as against a similar excess of 13.3 per cent shown a week earlier.

Crude oil production in the week ended April 8 averaged 4,416,100 barrels daily, 32,850 barrels above the figure for the preceding week, but 25,400 barrels less than the average recommended by the Petroleum Adminis-

ommended by the Petroleum Administration for War.

Estimated production of soft coal during the week ended April 1 was 11,500,000 net tons, 3.2 per cent below the preceding weekly figure, as com-pared with 10,996,000 tons in the cor-responding period last year.

Engineering construction contracts awarded during the week ended April 6 totaled \$33,963,000, as against \$29,-412,000 or the week before, according to Engineering News-Record. Contracts so far reported in 1944 show a decline of 51 per cent from the corresponding amount in 1943-private projects registering a recession of only 2 per cent, while public construction has dropped 57 per cent.

The Irving Fisher index of whole-sale commodity prices for the week ended April 14 was virtually un-changed at 112.9 per cent of the 1926 average, as compared with 111.9 a

year ago. Member bank reserves increased \$327,000,000 during the week ended April 12, and excess reserves rose \$100,000,000 to an estimated total of \$1,000,000,000. Business loans of reporting members declined \$27,000,000 in the same period but stood \$382,-000,000 above the total a year earlier.

40 pages of new,

up-to-the-minute

facto

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Here's new and up-to-the-minute data for designers, in concise, easy-to-use form. Users of industrial plastics... manufacturers looking for ways to utilize the advantages of Micarta to replace other materials... will find full and helpful information in this revised and enlarged Micarta Data Book.

Forty pages of property tables, performance curves and design suggestions provide working data for selecting the proper grade of Micarta for heavy-duty service in any field. Data covers both laminated, molded, and formed Micarta. Grades include those designed for ammunition chutes, bomb racks, instrument panels, pulleys, antenna masts, fair-leads, structural angles and channels . . .

Reserve your copy of the new Micarta Data Book today. Write Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N. J-06354-2

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Grades of Micarta—their characteristics... corresponding Army and Navy types.

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Designing Help—machining data... how to apply directional loads... molded and formed Micarta design suggestions.

Forms Available—standard shapes and sizes . . . plates, rods, tubes. angles, channels, zees.





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Policy Changes by Government Agencies Confuse Metal Market

Brass Again Scarce after Encouraging Outlook a Few Months Ago. More Aluminum Alloy Extrusions Available

By W. C. Hirsch

What seems to be overlapping of policy changes by Government purchasing agencies frequently puzzles the metal market. A short time ago, word came from Washington that the Army was discontinuing the use of steel for the

making of artillery cartridges and was going back to brass, "in a move expected to increase production by about 30 per cent and save \$100,000,000 in 1944." At the very time of this announcement steel producers reported that shell steel requirements had in-

creased substantially and made up a larger part of munition demand. Ordnance officers explained that the Army stopped using brass because of the apparent shortage in the supply of cop-per and zinc. "While severe manufacturing difficulties were anticipated in the use of steel," Major General Levin H. Campbell said, "the interest and cooperation and the determination of the technicians and production men of the steel industry proved the venture a success." By January, he said, the arms supply program had reached a point where considerable reduction was made possible in the production of small arms ammunition, thereby releasing large amounts of brass for artillery cartridge cases. Brass, the per-pound cost of which is many times that of steel, requires fewer operations in fabricating and the lower scrap loss is another offset.

Shortly after the appearance of rather comforting data regarding the copper and zinc outlook a few months ago, the picture changed and warnings went out to copper consumers to refrain from making plans that would entail increased use of copper and zinc for the present. Whether the increase in the need of brass, as the result of the Ordnance department's return to its use in artillery cartridge cases in place of steel, was responsible for this is not known, but the extraordinarily heavy takings of copper by fabricators in recent months are at least in part explained by this development.

The Operating Committee on Aircraft Materials Conservation reports that the situation with reference to aluminum alloy extrusions has considerably improved and that conversion to rolled form sections is no longer urgent. The widest use possible by the aviation industry of the standards of extrusion shapes and of standard rolled formed sections is, however, recom-

(Turn to page 64, please)



CAST AND WROT ALUMINUM ITTINGS



WE ARE proud that the Boeing Aircraft Company uses NIBCO WROT Aluminum Fittings in the famous Flying Fortresses that have changed the whole strategy of air warfare. NIBCO products are being used in ever increasing volume by more and more aircraft manufacturers because their uniform accuracy simplifies assembly and speeds up production. They're meeting the most rigid standards and the stiffest inspection. Remember NIBCO in your Post-war planning. We'll be glad to discuss your requirements any time.

Fittings



HERN INDIANA BRASS CO

ELKHART, INDIANA

VALVES AND FITTINGS SINCE 1904



PERSONALS

The Sheffleld Corp. has announced the appointment of Fred H. Markwick to the position of general plant manager of the

manufacturing division.

Henry A. Mackey has been appointed manager of advertising and sales promotion for the Gillette tire division of United States Rubber Co.

John M. Smith, formerly general manager of manufacturing for the RCA-Victor Div. of Radio Corp. of America, has been made vice-president in charge of manufacturing President president in charge of manufacturing president president

facturing P. R. Mallory & Co., Inc.
The Onsrud Machine Works, Inc., has
announced the election of the following
officers. O. Onsrud, Chairman of the Board;

officers, O. Onsrud, Chairman of the Board; R. F. Onsrud, President and General Manager and J. Knox, Secretary. Continuing in their same offices are T. W. Foote, vice-president and H. R. Krabol, treasurer. Dr. Stephen J. Zand, director of the Vose Memorial high altitude laboratory of the Sperry Gyroscope Co., has been elected a Fellow of the Royal Aeronautical Society. He is the thirteenth American to be so honored.

Skilsaw, Inc., has announced the appointment of Delmar M. DeWolf as advertis-



help make the "Water Buffalo" a powerful new weapon!

"Water Buffalo" amphibian tanks, made by Food Machinery Corporation in plants at San Jose and Riverside, California, and Lakeland, Fla., are credited with taking Makin Island. These vehicles, military authorities say, have at least partially solved the problem of getting Allied manpower onto hundreds of beaches now held by the Japs. • The Spicer Synchronized Transmissions used in the versatile "Water Buffalo" are typical of Spicer engineering and manufacturing ingenuity. When war came, these facilities were ready for instant service to the Allied Nations. And when peace comes, they again will be ready for immediate production to meet the great pent-up civilian demands for automotive vehicles. Spicer Manufacturing Corporation, Toledo, Ohio.



BROWN-LIPE CLUTCHES AND TRANSMISSIONS . SALISBURY FRONT AND REAR AXLES

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Committee Studies Production of Cars

(Continued from page 52)

lowed to enter the passenger car competitive field during the reconversion period.

Experimental work on postwar cars is permitted with limitation under Order P-43 recently amended and clarified by WPB. Manufacturers are allowed material for experimental purposes under an AA-2 priority for civilian products using non-controlled materials and a V-9 designation for the

controlled materials, steel, copper and aluminum, provided the producer does not divert manpower, technical skills or facilities from the war effort. Experimental models may not be used for sales promotion or shown to the public. P-43 does not permit building of experimental models prohibited by Government L or M orders. Thus building of a complete passenger car is forbidden by Order L-2-G issued in February 1942, when civilian production came to a halt. However, unless L or M orders are involved, manufacturers still can make experimental components such as a transmission, axle or body within the limits of P-43. During

the meeting WPB officials assured the manufacturers that orders will be issued continuing to liberalize the production of replacement parts, which also will have the effect of increasing production facilities that can be used when car assembly is permitted. It is generally agreed that any serious transportation crisis due to the lack of passenger cars can be avoided by WPB providing enough service parts and tires.

WPB regulations prohibit the sale of new machine tools for civilian products not specifically authorized by the Government. Used machine tools may be purchased from other manufacturers or dealers, but used tools owned by the DPC are in the same category as new tools. Thus a manufacturer cannot obtain new or DPC-owned machines to set up a standby line awaiting resumption of automobile production or to store until that time. It was estimated at the meeting that approximately 75 per cent of the industry's equipment has been converted to war production. It was the consensus that a Government policy should be laid down on the release of Governmentowned or new equipment. Permitting the automobile companies to place orders for new equipment and also to authorize its manufacture where no interference with war production is involved would serve a two-fold purpose. It would provide orders for machine tool companies whose production is declining and at the same time would expedite the reconversion process in the automobile industry.

The automobile companies were represented as follows: General Motors—C. E. Wilson and Albert Bradley; Ford—Henry Ford II and R. R. Rausch; Chrysler—K. T. Keller and B. E. Hutchinson; Willys-Overland—Ward M. Canaday and D. G. Roos; Nash-Kelvinator—G. W. Mason and A. M. Wibel; Packard—James H. Marks; Studebaker—Paul G. Hoffman and Courtney Johnson; Crosley—Powel Crosley and R. G. Cosgrove; Hudson—A. E. Barit and S. G. Baits. WPB was represented by Donald Nelson, chairman; C. E. Wilson, vice chairman; and J. H. Middlekamp, Automotive Division

director.

LET'S GET READY FOR IT

AN ANTI-FRICTION WORLD

NOW IS THE TIME! Alert manufacturers, determined that their products and plants shall be fully prepared to meet post-war competition, are drawing liberally on Aetna's long experience in the conquest of friction.

Conquering friction—in no other respect

has industrial science made more practical strides than in the broader use of antifriction bearings; better designs, more efficient applications, faster and better methods of manufacturevital improvement with which Aetna has had much to do.

How you, too, can utilize these betterments to the advantage of your plants and products—that is exactly where Aetna's engineers can serve you. Isn't it worth talking about? Aetna is ready—and now

is the time. AETNA
BALL BEARING
MANUFACTURING
CO., 4600 Schubert
Ave., Chicago 39, Ill.
IN DETROIT 2:
SAM T. KELLER,
7300 Woodward Ave.,
Madison 8840-1-2.



BALL BEARINGS

Policy Changes by Government Agencies

(Continued from page 62)

mended. OPA announces that a ceiling price of 15 cents per pound has been set for a new grade aluminum alloy, known as No. 356. This alloy is produced by blending from 50 to 70 per cent scrap with high purity primary pig. Production of primary aluminum in the United States in 1943 totaled 920,170 short tons, according to a Bureau of Mines report. This compared with 521,106 tons in 1942; 309,067 tons in 1941; 206,280 tons in 1940; and 163,545 tons in 1939.



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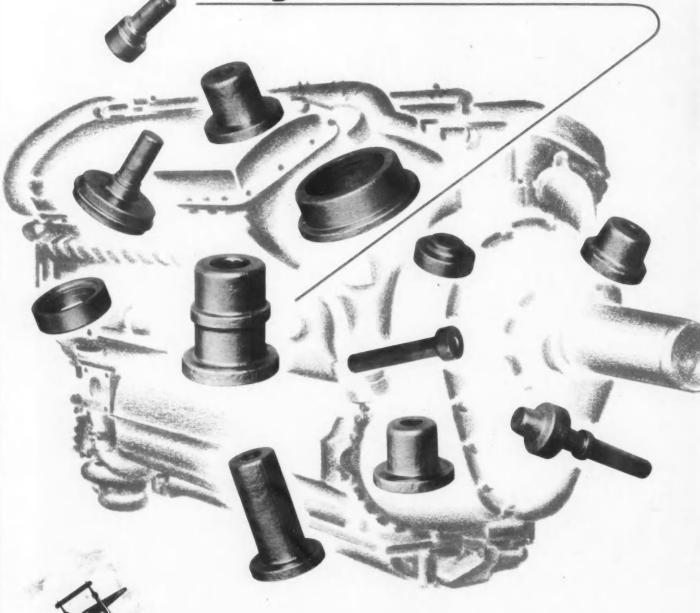
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Forged ENGINE Vitals



The 400 mile and higher speeds attained by our new pursuit planes subject engine forgings to terrific friction, heat and strain! Failure of a single part can cause disaster. Tube Turns forgings are standing the gaff demanded in engines which power the world's fastest aircraft!... Development engineers working on post-war problems, will find Tube Turns technical ingenuity and forging experience of practical value. TUBE TURNS (Inc.) Louisville, Ky.

TUBE TURNS Forgings for Industry

Symbol of U. S. Navy combat courage against overwhelming odds (see reverse side) is Sessions 5th in a series of 12 unusual war paintings presented by Tube Turns.



61-Foot Trailer Has 157-Ton Load Capacity



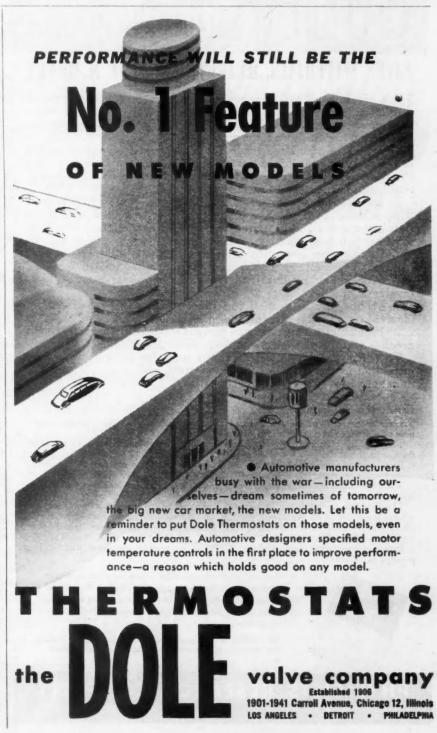
WO examples of what is believed the largest capacity trailer for road work in existence have been built in England for a haulage company with nation-wide connections. Each has a load capacity of 313,600 lb. The overall length is 61 ft., overall height 8 ft. 3 in., wheelbase 44 ft. 3 in. and outer track 7 ft. Each unit, one of which is shown above, consists essentially of a main frame and two swan-neck end members, carried on two four-wheeled bogies. The end members are hinged to the main frame girders, their upper ends being attached to the girders by a pair of hydraulic jacks or struts, by means of which the main frame can be lowered (to the ground, if necessary) to enable a high load to pass under low bridges, or raised to pass over "humped" bridges or severely uneven ground.

The hydraulic jacks are operated by two auxiliary gasoline engines, one carried on each swan-neck. Lifting the frame and its maximum load from the ground to a height giving a ground clearance of 34 in. takes 8 minutes. The jacks have a bore of 7 in. and a stroke of 16 in. Welding alone is used in the building-up of the main frame and the swan-necks.

Each four-wheeled two-axle bogie, with 15 in. solid rubber tires, has trunnion springing, the spring being 5 in. wide with eight plates % in. thick and three 1 in. thick, each tested up to a load of 42 long tons.

The great length of the trailer demands simultaneous steering of both bogies when-as at sharp corners-the outfit cannot be maneuvered appropriately with the rearmost bogie locked in alinement with the main frame as in normal trailer fashion. Hand steering is provided, therefore for each bogie, and at the rear is a detachable platform, with cabin, from which a steersman can operate, while keeping in constant communication with the tractor driver by means of microphones and amplifiers in the steersman's and driver's cabins. The trailer can be run in either direction since it is possible to install the steersman's platform at either end.

All wheels are air-braked. Shoes are expanded by Lockheed 2 in, wheel-cylinders. A Bendix-Westinghouse relay system give simultaneous brake action on both bogies. The makers are Cranes, Ltd., Dereham, Norfolk, Eng.





MATERIALS, REJECTIONS, TIME & MONEY

N WAR plants all over the country, Profilometers are at work measuring the roughness of machined surfaces—on aircraft engine parts, shell dies, bearings, and thousands of other parts that go into the machines with which we wage war.

Demands of war have made the Profilometer* a useful gaging device wherever machined parts are produced. Why? Because the Profilometer, by providing a means of measuring surface roughness, enables uniform control of surface quality.

In time of war, control of surface finish is of utmost importance. Time is short . . . the highest production must be maintained. Materials are scarce . . . waste must be kept at a minimum. The Profilometer is helping to meet these requirements.

A Profilometer inspection on intermediate finishing operations will greatly facilitate final finishing of the part to specified dimensions.

rofilometer readings will show whether parts meet surfaceroughness specifications.

* Profilometer inspection can prevent waste of valuable time incurred by finishing parts beyond specifications.

☆ Profilometer inspection can prevent waste of materials through needless scrapping of rejections that can be reworked.

Thus has the Profilometer proved its value in war-production inspection in the saving of materials, time, and money. There is a moral here, too, for postwar planners.

What is the Profilometer?

The Profilometer is an electronic instrument which indicates the average roughness of a surface in microinches (millionths of an inch).

The Profilometer is a rugged self-contained, production instrument designed

for use in the shop.

Profilometer readings are given directly on the dial of a meter—no computations by the operator are needed.

With the Profilometer, any workman, with a minimum of training, can obtain

accurate and consistent measurements.

The Profilometer with the Tracer supplied as standard equipment will measure a large majority of all machined, ground, and finished surfaces. Numerous accessing sories are available for measuring in small holes and slots, on gear-teeth, and other hard-to-reach surfaces.

Inquiries regarding your surface-roughness measuring problems will receive prompt attention.



We will be pleased to send you a copy of our recent booklet Practical Measurement of Surface Roughness, a non-technical discussion of surface-roughness measurement with a description of the complete Profilometer equipment.

*Profilometer is a registered trademark indicating Physicists Research Company's brand of surface-roughness gaging equipment,

YSICISTS RESEARCH COMPANY

343 SOUTH MAIN STREET

ANN ARBOR, MICHIGAN

More than $2\frac{1}{4}$ Million Military Vehicles Built

(Continued from page 50)

week. Ground for the plant was broken April 18, 1941, and production of parts of a limited scale began in September, 1941. Each B-24 bomber contains 465,472 parts, of which 375,-000 are rivets.

"Chrysler Corporation's Dodge-Chicago plant is now producing and shipping in substantial and increasing quantities each month 2,200-hp Wright air-cooled engines," President K. T. Keller recently announced. This engine is installed in the new Boeing B-29 bomber. Employment now totals 23,-000 workers, or 60 per cent of the year's goal. At the present rate of production, the plant is now using 1,500 tons of aluminum, 500 tons of magnesium and 1,500 tons of steel per month. The two Dodge-Chicago foundries are melting about 125,000 pounds of aluminum and 50,000 pounds of magnesium daily. First aluminum castings were poured in March, 1943. Through March, 1944, the foundries had produced more than 125,000 castings. During January the forge shops completed 225,000 forgings fabricated from 1,350 tons of steel. Total deliveries of forgings number in excess of 1,000,000 pieces.

Eastern Aircraft Division of GM recently delivered its 2,500th FM-1 Wildcat fighter plane to the Navy from the assembly plant at Linden, N. J. The first Wildcat produced by GM was flown at the Linden plant airport on Sept. 1, 1942. Last December Eastern Aircraft delivered its 1,000th TBM Avenger torpedo bomber to the Navy from the Trenton, N. J., plant. The Bloomfield, N. J., plant of Eastern Aircraft makes electrical and control assemblies for the Wildcat, while the Tarrytown, N. Y., and Baltimore plants turn out components and sub-assemblies for the Avenger.

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Nash-Kelvinator Corp. recently completed on schedule a Navy contract for

three types of bomb fuses for bombs of 100-pound size and up.

The 1944-45 naval appropriation bill calls for \$8,200,640,000 for naval aircraft, to be used for the procurement and operation of 24,230 airplanes. Combat aircraft will be increased by 1,128 planes to a total of 19,035 planes. Trainers, transports and other noncombat types account for the other 5,195 airplanes.

Dow Receives Gold Medal Award of AIC

Dr. William Henry Dow, president of The Dow Chemical Company, Midland, Mich., has been selected to receive the Gold Metal Award of the American Institute of Chemists for the

BLONDE? MAYBE--SMART? COULD BE!
MUSCLE? NOT MUCH ----BUT,
BROTHER, SHE'LL DO A WHALE OF A JOB
ON YOUR ASSEMBLY LINE IF YOU
USE THE RECESSED HEAD SCREW
THAT MAKES SCREW DRIVING TROUBLEPROOF --THAT ENDS



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TRIES

PROOF A -- THAT ENDS
THE NEED FOR SKILL
AND BRAWN
----IT'S PHILLIPS

Anyone can drive Phillips Screws!

Time was when it took real "hemen" to drive screws. They had to be strong...had to have skilled hands...had to be trained. But

wday the job's a cinch for anyone!
What makes it a cinch is the
Phillips Recessed Head Screw—
the screw which, time studies
prove, steps up screw driving
speed as much as 50 per cent.

With Phillips Recessed Head Screws, there's no premium on brawn! They drive easy – because turning power is fully utilized. Nor is there any premium on

er skids are out, and workers just can't fumble, make wobbly starts, or drive slantwise.

As a result, untrained girls quickly match anything experienced male operators do – driving Phillips Screws.

Think what this means to you in (1) man-and-training hours saved, in (2) increased production, in (3) finer workmanship. Then ask yourself if you're getting the same advantages from slotted head screws . . . or from any other type you're using.

TO MAKE WARTIME QUOTAS AND PEACETIME PROFITS

Fuster Starting: Driver point automatically centers in the Phillips Recess . . . fits snugly. Fumbling, wobbly starts, slant driving are eliminated. Work is made trouble-proof for green hands.

Fester Driving: Spiral and power driving are made practical. Driver won't slip from recess to spoil material or injure worker. (Average time saving is 50%.)

Easier Driving: Turning power is fully utilized. Workers maintain speed without tiring.

Better Fustening: Screws are set-up uniformly tight, without burring or breaking of screw heads. The job is stronger, and the ornamental recess adds to appearance.



IDENTIFY IT!



Center corners of Phillips Recess are rounded . . . NOT source



Bottom of Phillips Recess is nearly flat. NOT tapered to a sharp point.



PHILLIPS Rocessed SCREWS

WOOD SCREWS . MACHINE SCREWS . SELF-TAPPING SCREWS . STOVE BOLTS

23 URLES

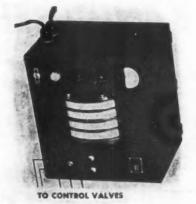
Ameritan Screw TCo., Providence, M. 1.
Atlantic Screw Works, Martford, Com.
The Bristol Co., Waterbury, Coin.
Central Screw Co., Chicage, III.
Chandler Preducts Carn., Cleveland, Ohio
Continental Screw Cor., New Bedfard, Mass.
The Corbin Screw Corp., New Bristain, Configuration of Continental Screw Mfg. Co., Chicage, III.

The N. M. Harper Co., Chicage, III.
International Serew Co., Detreit, Mich.
The Lumson & Sessiens Co., Cleveland, Ohio
Manufacturers Serew Products, Chicago, III.
Milford Rivet and Machine Co., Milford, Cenn.
The National Serew & Mig. Co., Cleveland, Ohio
New England Serew Co., Keese, N. M.
Parker-Kalon Corp., New York, N. Y.

Pawticket Screw Co., Phyticket, R. 1.
Phooli Manefacturing Co., Chicage, Ill.
Reading Screw Co., Norristown, Pa.
Russell Bordsail & Ward Bolt & Nut Co., Part Chester, N. Y
Scovilj Manufacturing Co., Waterville, Conn.
Shekepreef Inc., Clike ngs, Ill.
The Southington Mardware Mfg. Co., Southington, Conn.

New Products

(Continued from page 48)



pany, Chicago, Ill., is designed to change minute pressures which might be expressed in inches and tenths of inches of water into electrical reading. This is done by a very sensitive pressure measuring device which operates on a no-point principle utilizing a Wheatstone bridge electrical circuit. The pressures are converted into actual inches and tenths readings which are

on a drum indicating unit. This instrument has a range of 0 to 100 in. of water with a sensitivity of 1/40 in. and an accuracy of plus or minus one tenth of 1 per cent. The unit also is available in much lower ranges of 0 to 5, 0 to 30, and 0 to 50 in., having correspondingly better degrees of sensitivity with the same percentage of accuracy.

Trimount Electric Manometer

Waterproof Horn

The Sparks-Withington Company, Jackson, Mich., has designed a water-proof horn for use on combat vehicles and other heavy motor vehicles. This new Sparton horn produces a penetrating tone of 120 decibels, and is said to operate with maximum efficiency in

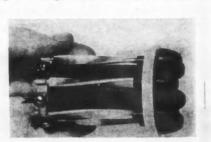


Sparton horn

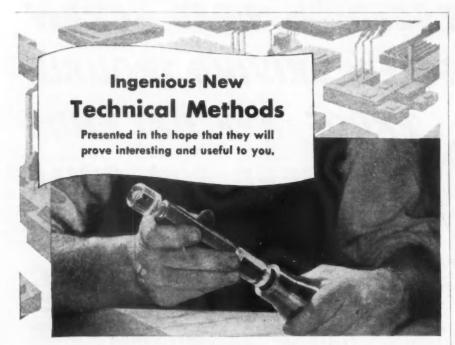
sand, mud, or slush. New type brackets make it easy to install and, being waterproof, it can be mounted on fender, running board or cab, also under hood on dash or motor block. The new horn will be available in 6, 12, and 24 volt capacity. It is 6% in. high, 5% in. wide, and weighs 3% lbs.

Multiple Potentiometer

A multiple control has been placed on the market by the American Pattern & Manufacturing Company, Detroit, Mich. In this device, operable either as a rheostate or as a multiple potentiometer, a number of contactors roll upon a single resistance coil. Each of



Potentiometer made by American Pattern & Mfg. Co.



Precision Ground Glass Gages Afford Visibility in Inspection

In the hands of the skilled mechanic, glass gages bring an important plus function to precision gages. It not only checks the new tool's size, but gives the inspector an idea of what kind of surface to expect from that particular tool. The visibility permitted by the glass gage allows the inspector to see the surface in blind holes as well as through holes.

Some of the apparent advantages of the glass gage follow: Glass gages afford visibility in inspection. Glass gages are not subject to corrosion. There is less tendency to gall in some applications. Sense of feel is more pronounced when using glass gages. Because the thermal conductivity of glass is less than steel, body heat of inspectors will not be transmitted so rapidly to the gage to affect gaging dimensions.

Chewing gum, too, is really useful and helpful in these tense times to people who are working on the production front making material for our war effort. But, our Armed Forces have been constantly increasing their demands for Wrigley's Spearmint, Doublemint and Juicy Fruit. It is only natural that we and you both feel that the needs of our fighting men and women come first.

You can get complete information from Industrial Glassware Division of the T. C. Wheaton Co., Millville, N. J.



Glass gages are not subject to corrosion or rust



Visual inspection of surface coincident with inspection for size.

V.113



N the answer to this extraordinary question is a curious story. For two scientists once posed that very question to themselves . . . and the answer was Yes!

They actually built a machine with the power to "learn" by experience and "remember" what it had learned—a mechanism capable of simulating the rudimentary behavior of a rat. Comprised of solenoids, gears and relays, it traveled a grooved track forked by 12 dead-end side-tracks-equivalent to the blind alleys which a living rat encounters. Set to take the deadend forks, as if by an inner compulsion, this robot rat literally learned by experience to avoid the frustrating blind alleys, in a perfect mechanical analogue to the conditioned reflexes of the brain.*

To build a machine that would reproduce all the behavior of a rat "would require a mechanism probably as large as the Capitol at Washington"-but it could be done!

For we're at the beginning of an amazing new technological age. Already there are many kinds of thinking machines in our incredibly mechanized world, helping to speed production, cut costs and build better products. And intimately a part of this whole story is the science of machine tool engineering.

Today, Jones & Lamson engineers are working with the leading manufacturers in virtually every industry, helping them to plan production now for the machines and the products of tomorrow.

They are at your service, too.

* In "The Advancing Front of Science" by George W. Gray, a memorable chapter on thinking machines reports this story in full.



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ONES & LAMSON

SPRINGFIELD, VERMONT, U.S.A. Profit-producing Machine Tools

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes . Automatic Double-End Milling and Centering Machines · Automatic Thread Grinders · Optical Comparators . Automatic Opening Threading Dies and Chasers.

May 1, 1944

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

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Millionths of an inch accuracy in these Vital Aircraft Parts is achieved by Western Automatic on a quantity basis

• It's no job for amateurs, making these Lycoming R-680 aircraft engine cam followers and cam follower guides of alloy steel. Clearance between walls of follower and guide must be held between .0013 and .0003 inch—and the mating diameters are ground and honed to a 10 micro-inch finish, a mere 10 millionths of an inch! And they've got to be interchangeable—they're not factory paired. It pays you to know about Western Automatic's production ingenuity, skilled workmen and vast precision equipment that turn out work like this on a quantity basis for war—and that can do it for your post-war needs after Victory. We may not be able to help you now, but we suggest that you write us for complete facts now.



the contactors is in the form of a twisted bar and is insulated from each other contactor to engage successive convolutions of the coil. This construction is said to permit accurate control of the current supplied without influencing the current delivered by any of the other contactors.

The illustration shows a unit having six contactors but it can be made with any desired number.

Heavy Duty Solderless Tube Cap Terminals

The solderless tube-cap terminals produced by Aircraft-Marine Products, Inc., are designed for adaptation to heavy load, high temperature operation on power tubes. These tube-cap terminals, which can be furnished complete with leads, are said to be practically



Solderless tube-cap terminal

independent of temperature operation. Caps and leads are made in various metals for operation in any range of temperature.

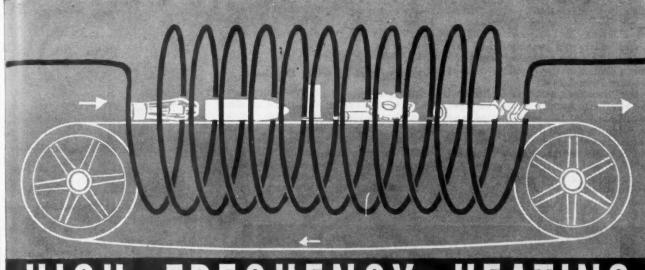
Hot electro-tinning assures corrosion resistance for all types of caps and leads available. The Diamond Grip tube-cap units are for use on insulated wire where an insulation-support type of terminal is required. The standard Type "B" units may be used on either insulated or non-insulated wire. Each type of tube-cap terminal is available as an individual item or may be ordered as an integral part of a complete lead built to users' specifications.

co

Chemical Treatment Makes Soil Waterproof

A chemical method of preventing mud by making soil waterproof has been developed by Hercules Powder Company, Wilmington, Del., for use on roads, airplane landing fields, and other construction projects. Stabinol can be used to stabilize unsurfaced dirt roads in rural areas where the traffic is light, or it can be mixed with soil that serves as the base on main highways with hard wearing surfaces.

By mixing Stabinol, a resin compound, with the top few inches of soil,



HIGH FREQUENCY HEATING

is on the move!

In hundreds of new applications it's improving product quality at higher-than-ever speeds and lower heating costs. Here's what Ajax-Northrup users say about high frequency for

FORGING, UPSETTING: Faster, automatic. Lower unit heating cost. Less scale, hence greater dimensional accuracy and longer die life. Compact, dependable equipment takes little space.

Example: A hot 75mm. billet every 28 seconds with a 5-heater set-up for forging. Accurately timed green lights set the pace for the operator. In one 8-hour shift, one upsetter turned out 960 perfect shells!

BRAZING: Perfect joints — almost no rejects. Less warping, scale, or residue. Easy to handle. No fumes or excessive heat.

Example: 24 perfect brazed fuse seat liners per minute with battery of four Ajax-Northrup brazing units. Loading is easy and no clean-up is needed.

HARDENING: Fast, precise control needed for jobs ranging from self-quench to through hardening. Can achieve any heat pattern.

Example: The noses of nearly 6,000 armor-piercing shells are hardened in one day with a single 6-kw. Ajax Northrup unit.

BUILT-IN induction heating is on the horizon for higher-production machines of tomorrow. Already Ajax-Northrup equipment is one of industry's best, most dependable tools. Bring your plans to us and let us engineer your high frequency heating.

POST-WAR SUGGESTIONS

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Equipment bought for one war purpose can easily be converted to your peace-time heating. In most cases all you'll have to do is change a coil on the heaters, or connect up new brazing or hardening coils.

For example, you may be able to do a large part of your future forging, melting, and heat-treating (or any of hundreds of other jobs that are now being done by high-frequency) with equipment you install for shell forging.

AJAX-NORTHRUP HIGH-FREQUENCY

AJAX ELECTROTHERMIC CORPORATION . Ajax Park

ASSOCIATE COMPANIES . . . THE AJAX METAL COMPANY. Non-Ferrous Ingot Metals.

AJAX ELECTRIC FURNACE CORPORATION. Ajax-Wyatt Induction Furnaces.

AJAX ELECTRIC COMPANY. INC. Ajax-Hultgron Sait Bath Furnaces.

AJAX ENGINEERING CORPORATION. Aluminum Melting Furnaces.



HEATING TRENTON 5 N

MELTING

May 1, 1944

When writing to advertisers please mention Automotive and Aviation Industries

73

a waterproof surface is obtained. The water will drain off or evaporate, rather than seep through the treated soil and turn it into mud. Stabinol-treated soil resists penetration of surface water, the chemical company claims, and also the capillary rise of moisture from below.

Only fractional amounts of Stabinol are required, usually about one per cent of the total soil to be treated, and the "stabilized" soil has the same appearance as the original dirt. Stabinol does not increase the load-bearing capacity of soil, but it will prevent the soil from getting wet and thereby losing its strength.

Hercules states that this effect of soil stabilization will last for years. Roads laid down more than five years ago, for example, are still waterproofed.

Economy Set of Gage Blocks

An economy set of 37 Doall gage blocks is now available in two qualities from Continental Machines, Inc., Minneapolis, Minn. These gage blocks are packaged in a newly designed pocket carrying case, which holds the blocks on end for ease in handling and identifying. This position also prevents grit and dust from settling on the



Doall economy set of gage blocks

polished measuring surface. The case measures 7½ in. by 4 in. by 2 in.

The set includes two .050 in. wear blocks in addition to the five standard series of gage blocks regularly offered. All blocks, when wrung altogether, give an overall measurement of 11.7995 in.

These gage blocks are available in two qualities sets: Set "A", "Inspection Quality", is guaranteed in height, flatness, and parallelism accuracy within plus or minus .000004 in. at 68 F; Set "B", "Working Quality", is guaranteed in height, flatness, and parallelism accuracy to within plus or minus .000008 in. at 68 F.

Duo-Directional Sound Reproducer

The Model HI-8 duo-directional baffle reproducer, a product of Executone, Inc., New York, N. Y., can be used in conjunction with Executone's music and voice-paging systems.

An 8-in. permanent magnetic speaker having a 6 ohm voice coil is enclosed in this acoustically designed baffle. Openings front and back provide duo-directional transmission. Since most plants vary greatly in noise levels, layout and areas to be covered, this unit is designed for use in any size area where up to medium noise conditions exist and wide angle distribution of sound is desired.

The baffle is equipped with an internal mounting for a special transformer which matches the impedence of the reproducer unit to the wiring line and amplifier.



Model HI-8 baffle reproducer



ON THE BLANCHARD

HERE are two surface grinding problems that came to the Blanchard Engineering Department in one week: CHECK THESE (1) Grind a hardened steel ring 861/2" in diameter to a tolerance of ±.0002" for thickness. DVANTAGES

(2) Grind the edges of a steel strip, .005" thick, .125" wide, and 20" long, straight and to a tolerance of ±.0005".

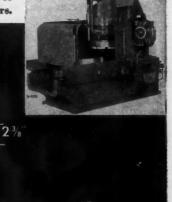
Thirty years experience in grinding flat surfaces enabled Blanchard Engineers to solve the grinding of both of these jobs, using Blanchard vertical Surface Grinders and Blanchard Grinding Wheels.

If you have work which lies within the range here indicated, you should investigate the possibilities of a Blanchard.

Whether the job is large or small, usual or unusual, Blanchard can show you how to grind it better and faster.

CAMBRIDGE, MASS.

Grinding Hardened Steel Rings and Edges of Steel Strip on Blanchard Surface Grinders.



BLANCHARD GRIND

86 1.125" ± .0002 BLANCHARD GRIND

valuable on jobs like

the one illustrated.

Production

Adaptability

Fixture Saving

Operation Saving

Material Saving

Fine Finish

Close Limits

. Especially

Flatness

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



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HOW TO MAKE

The grea mostatic I 6850, as conpermits the lighter weigh compensating when either is element.

Chace makes 35 d. mostatic bimetal a offers specific advanabuilding of thermal cayour controls function machines or in peace whether in aircraft or a dustry or in the home, the of Chace Thermostatic Bin suited to your demands.

Send us detailed information and your problem and get our recedation for type of thermostatic abest suited to your needs.

WM. CHACE C.

Thermostatic Bimetals and Special Alloners of the property of the



New Production Equipment

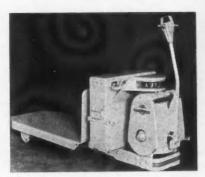
(Continued from page 44)

of all six heads as a unit. Change-over from low to high work is quickly accomplished on the same machine.

Flexibility of speed ranges has been stressed, and a dual speed range gives low speed with more power for slow, heavy cuts, or high speed for the smaller diameters. This is so designed that one or two spindles may be in low speed while the others are in high range or vice-versa. At the loading station is located a fluid motor drive used to job the spindle for targeting and indicating purposes.

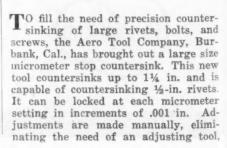
AUTOMATIC TRANSPORTATION COMPANY, Chicago, Ill., offers a new lift truck, the "Transporter," in two capacities. The smaller model is designed for loads up to 4000 lbs, while the larger one has a capacity of 6000 lbs. Platforms either 20 in. wide or 261/2 in. wide are available on both models.

The Transporter is a combination of a foot-operated hydraulic lift platform with electric power front wheel drive.



Transporter lift truck

The single front drive wheel turntable is fitted with a tubular steering handle which has built-in push buttons for forward and reverse speeds. A constant torque controller provides two forward and two reverse speeds which are obtained by lowering or raising the steering handle beyond brake release position. The controller is mechanically interlocked with the drive unit brake, which is applied when the steering handle returns to vertical position. Steering with full power can be attained at any angle through 210 deg







Machine tools give meaning to this

jury's verdict!

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It wasn't much of a story. By news standards today it was strictly Page 14. The night City Editor slugged it "delinquent—local" and the man in the slot gave it a one-column head. JURY BLAMES SLUMS FOR JUVENILE CRIME.

"Health stations, more hospitals and schools, recreational and training facilities, low-cost housing projects and community centers were recommended by the grand jury, in its final presentment yesterday, as measures to check the rising tide of juvenile delinquency in this etc., etc., etc."

Few people read it. In the midst of war and politics, it was strictly Page 14.

That's why we're running it. Because that story should be a Page 1 MUST in every city in America. Because that jury's verdict is a national challenge. Because it gives the lie to every brand of private or political complacency which turns away from one simple, unvarnished truth: Our sons are fighting for a better world than they left behind—and total victory is a long way off!

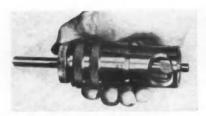
What has the machine tool industry to offer here? One very real contribution: The engineers of the basic machine tool producers have helped the men of government and of industry to plan the most desperate and gigantic production program of all time. . . and they can help those same men in planning today for the peace that must be won after the war is won!

One of these is a Bryant man. We invite you to send for him.



Bryant Chucking Grinder Company

SPRINGFIELD, VERMONT, U.S.A.



Micrometer stop countersink made by Aero Tool Co.

and can be made while the tool is in operation. The standard countersink includes a precision ground interchangeable 1 in. diameter cutter, available in 72. 78, 82, 100, 110, and 115

deg. angles, with or without integral pilot.

Radial bearings are bronze, and thrust bearing ball type. Stop is spring loaded for positive action and safety. Cutters are made from heat-treated high speed steel.

A HEAVY duty chip breaker and diamond finishing grinder has just been introduced by Hammond Machinery Builders, Inc., Kalamazoo, Mich.

This new grinder, known as Model CB-76 Hammond Chip breaker and diamond finishing grinder, is designed for accurately grinding chip breaker

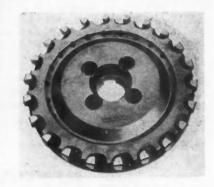


Hammond chip breaker and diamond finishing grinder

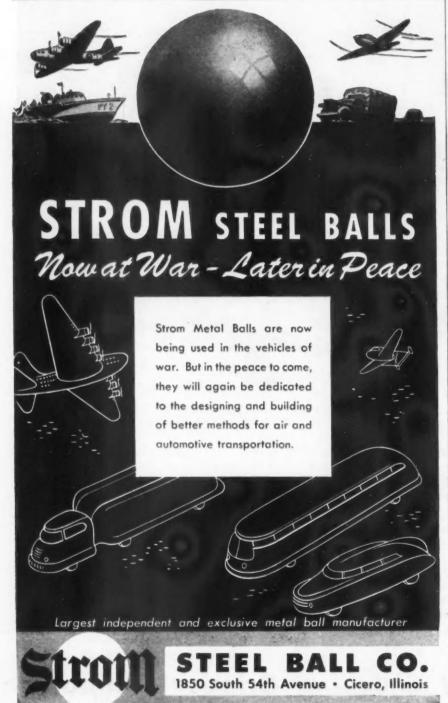
grooves, and for precision finishing of all single point carbide tipped tools requiring smooth, sharp cutting edges, it is said. It features a newly designed any angle vise that will handle all types of box and single point tools up to 2 in. (and larger if required). The any angle vise has universal adjustments and the dials are of the directreading type.

The diamond finishing grinding side (left side of illustration) is designed for use of either a 6 in. or 7 in. diameter cup wheel. The tilting table assembly is moved in and out by screw adjustment. Table-well clearance permits wheel changes without necessity of removing table assembly. A safety cup disc prevents operator getting fingers or tools into cup of cup wheel during operation.

LOVEJOY TOOL COMPANY, INC., Springfield, Vt., has designed a new heavy duty face milling cutter. The new mill is referred to as the Type "H." The blades in this cutter are 1 in. in diameter, capable of taking cuts up to ¾ in. The Lovejoy locking principle is employed and the blades are interchangeable through the complete range of Type "H" sizes. (Page 80, please)



Type H face milling cutter





GLOBE STEEL TUBES · · Basic Material in the Construction of All Types of Military Equipment

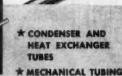
Airplanes, ships, tanks, trucks, jeeps, water stills, bailout oxygen bottles for aviators, torpedoes, bombs and other types of ammunition, rolling kitchens — nearly every kind of front line and back-of-the-lines equipment requires steel tubing as an essential component.

The physical "specs" for these tubes vary all the way from high strength for support and pressure applications to high resistance to corrosion from food acids or exhaust gases.

Globe Seamless Pressure and Mechanical Tubing, Globe Stainless Steel Tubing (Seamless and Gloweld) and Globeiron Seamless Tubing have helped solve most problems in steel tubing encountered by the builders of equipment for our armed forces. Globe engineers and Globe production facilities have rendered service to many manufacturers in carrying on wartime activities. Globe's completely equipped chemical and physical laboratory is constantly available for any tests desired by users of steel tubes.

GLOBE STEEL TUBES CO., Milwaukee 4, Wisconsin





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VITAL IN WAR ... VALUABLE IN PEACE

NO postwar job will ever compare with the urgency of wartime production. For while the war is on, a minute saved may mean a life saved, too.

Yet minutes will still be valuable when peace returns. To save a minute is always to cut a cost. And it is the low-cost producer who will be most successful in the competitive postwar field.

Acme can save you minutes—wartime minutes and peacetime minutes as well. If you need new dies, patterns, heat-treated aluminum castings, Acme can supply them. Should your present or postwar production require special tools, Acme can both design and build them.

Acme consulting engineers have helped many a wartime producer to conquer production line problems. These same engineers will be equally helpful during the critical transition from war to peace.

Preliminary recommendations submitted without obligation.

A C W E Pattern and Tool Company, Inc.

FOR VICTORY BUY WAR BONDS

HEAT-TREATED ALUMINUM CASTINGS . . PATTERNS . . . TOOLS TOOL DESIGNING ... PRODUCTION PROCESSING

The Type "H" mill is furnished in diameters 6 in. to 8 in. inclusive, for shell-end arbor mounting, and di-ameters 9 in. and larger for spindle mounting.

Many of these new cutters have been furnished with negative cutting angles. The 1 in. diameter blades provide rigid support for the carbide tips for this type of application.

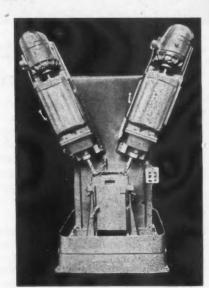
T HE Barnes Drill Co., Rockford, Ill., has placed on the market a new special hydraulic production drilling unit. This unit can be arranged for drilling, reaming, facing, boring counterboring or tapping operations in any one or combination of horizontal, vertical or angular positions. The unit is available in three sizes (Nos. 5, 10 and 20) and each size is motorized according to the requirements of the job. The No. 5 unit is equipped with a 5 to 7½-hp motor, the No. 10 unit with a 10 to 15-hp motor, and the No. 20 unit with a 20 to 25-hp motor. The Nos. 10 and 20 units have the essential working parts built-in complete with a single motor, driving the spindle rotations and hydraulic pump for any automatic hydraulic feed cycle. The No. 5 unit is equipped with a separate motor-driven hydraulic system. The unit is arranged to give rapid approach, variable feed and quick return.

Used vertically as a hydraulic production machine, the unit is capable of performing simultaneous drilling, reaming and counterboring operations. These units can also be arranged vertically in combination with angular and horizontal applications.

The units can be arranged for horizontal operations, either as single units, grouped around an indexing table, or

in combination with vertical and angular applications. Each unit has a flange support for mounting interchangeable auxiliary heads of any desired number and arrangement of spin-

dles.



Barnes drilling machine equipped with two automatic hydraulic drilling units

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Reproductions of this page on enameled paper are available for bulletin board use in your turret lathe department. Write the Gisholt Machine Company, 1205 East Washington Avenue, Madison 3, Wisconsin. Ask for the series of "Wartime Care and Operation Posters." State quantity desired.

Mere trickles aren't enough. When using any coolant,

flood the tool and the work for best results.

Fit-up for Welding Magnesium

(Continued from page 34)

inclusions into the welds. Such coat- butt joints. Good fit-up of the edges, ings can be removed most effectively with a wire brush or emery cloth. Unpickled surfaces also should be cleaned before welding because magnesium oxidizes very readily and the oxides remain as inclusions in the welds and also hinder welding.

Backing Plates

Backing plates can be used to shape

as in the free drop-down method, is not required, for the backing plates limit the amount of metal which can drop down to form the bottom bead. While steel and copper backings have been used on butt joints, stainless steel backings seem to have some advantages, at least in welding thin material. Copper and steel backings tend to freeze the weld metal too rapidly, the reinforcing bead on the bottom of leaving cold shuts, wrinkles, porosity,

and oxides in the bottom of the welds. Their high heat conductivity also requires the use of correspondingly higher welding current. Stainless steels having a heat conductivity about one-third that of ordinary steel have been found to be very successful as backing

Light-gage stainless steel, with a backing groove formed in it and backed up with an asbestos board of some sort, is very effective as a low heat conducting backing. Asbestos should never be used next to the weld for it contains moisture which it evolves when heated. Water causes extreme porosity in the

Strength of Magnesium Alloy **Butt Joints**

In the welding of magnesium alloys of 1/8 in. gage and lighter, some difficulty may be experienced in obtaining a high tensile strength due to a lack of fusion in the root of some welds. This lack of fusion at the root of the weld is evidenced by a fine line which upon microscopic examination proves to be the exterior of a crack extending into the weld. Tests have shown that welds with this crack have a low tensile strength. It is believed that this crack is the result of a tough refractory oxide skin which forms on magnesium. While the plate edges may appear to have been fused all the way to the bottom of the joint, the oxide film seems to prevent the mingling of the metal at the root of the weld.

Apparently, some mechanical agitation would seem to be required to break up this film. If a very slight bevel is provided at the bottom edges of the plates, the edges will part from one another as they drop down to form the bottom bead. This allows molten filler metal to flow into the gap between the edges, washing them of the oxide, and forming a solid homogeneous structure at the root of the weld. The elimination of the crack by this reverse bevel method has resulted in welds having 90 to 95 per cent of the ultimate tensile strength of the original material.

The macrographs in Fig. 1 show the effect of the "reverse bevel" in welds on light gages of magnesium alloys. Fig. 2 shows a drawing of a reverse bevel, exaggerated for illustration pur-

New Rolls-Royce Griffon

(Continued from page 33)

to operate such items as the retractable undercarriage, wheel brakes and wing flaps, blind-flying instrument panel and generator for radio installation. Normally, it may be recalled, these accessories are mounted on the engine wherever arrangements can be made to drive them; but, obviously, the provision of an independent gearbox makes for simplification of engine and the accessory installation and their subsequent maintenance.



Mirror finish bore, straight, round and con-centric, plus perfect pis-ton fit, assures efficient use of air power.



For perfect control of

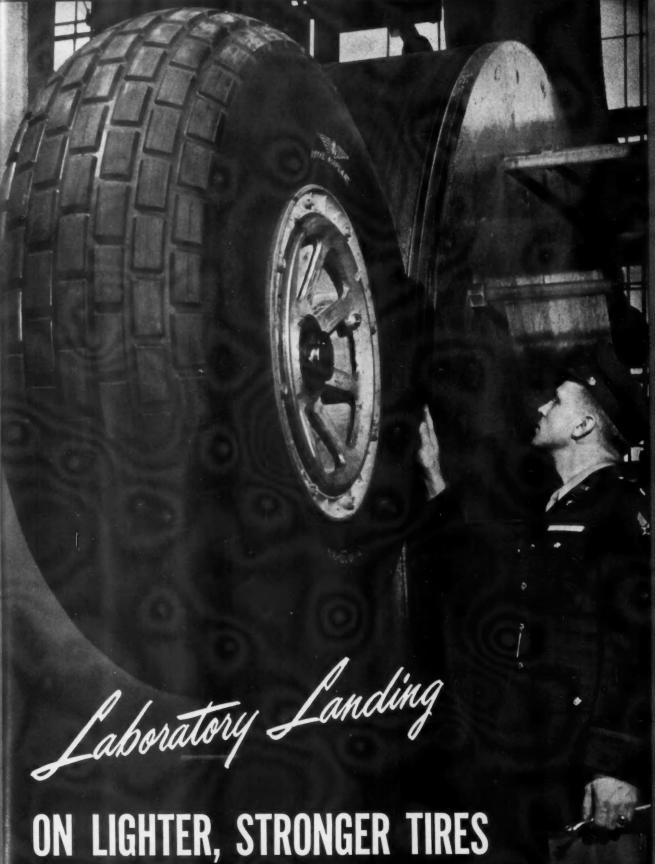
Use them to replace antiquated methods, to release manpower for more productive work, to save time, cut handling costs, speed-up production lines. NOPAK Heavy Duty Cylinders enable you to make full use of low-cost airpower for the heavier tasks of pushing, pulling, lifting or lowering. They are fast, smooth and positive in action, economical to operate.

NOPAK Heavy Duty Air Cylinders are extremely rugged in construction. Cylinder flanges are welded to body, eliminating tie-rods. Cast steel heads are bolted directly to flanges. Extra large piston rods can be furnished in alloy steels where extra strength is needed.

The NOPAK Heavy Duty series is made in a full range of standard sizes up to 12" bore for air pressures up to 250 lbs. Our engineers will gladly submit recommenda-tions based on your specifications. Write today!

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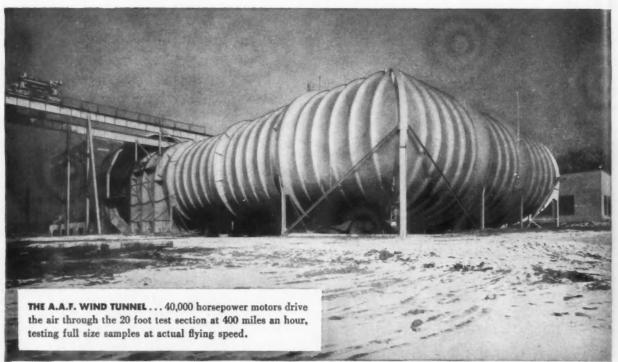
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UNITED STATES RUBBER COMPANY

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Official Photo U.S. Army Air Force

FINDING TOMORROW'S ANSWERS TODAY!

The Army Air Forces must have the answers to tomorrow's questions — today.

That is why in 1917, the War Department established an aircraft engineering laboratory at Dayton, Ohio. Since that time, AAF technicians from this field have worked hand in hand with airplane tire manufacturers to build lighter, stronger, safer tires, to build better equipment for every type of service in the air.

Today in a giant, 400 mile-an-hour wind tunnel, they are testing new types of radio antenna masts electroplated by the United States Rubber Company's Ekko Process and many other important new developments. In the Materials Lab they are testing cotton and rayon and nylon cord.

In service and in combat they are piling up

data under actual flight conditions... and passing that information on to American industry. And from the war theatres of the world, the experience of combat fliers channels back to the nation's builders of airplanes and airplane equipment.

Planning, testing, searching far into the future, the AAF, working with industry, is keeping our Air Forces out in front of the enemy in fighting power — by finding the answers to tomorrow's questions today.

For the invaluable cooperation of all branches of the Army, Navy and Merchant Marine in their constant effort to improve the equipment of our fighting men, United States Rubber Company expresses its sincere appreciation.

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HOW THE AAF HELPS INDUSTRY BUILD BETTER EQUIPMENT FOR OUR FIGHTING MEN



Official Photo U.S. Army

LABORATORY TESTS ... In the Materials Lab of the AAF all parts of the tire are tested, the findings tabulated, compiled and reported to the tire makers. C. J. Cleary, Assistant Chief, Materials Lab says, "Give us a material that has no weight and no mass and having infinite strength - and we will have reached our ultimate goal.



COMBAT TESTS . . . In actual combat and in service tests the performance characteristics of all types of tires are constantly checked. U.S. Royal Airplane Tires with bodies built of rayon or nylon and treads of synthetic rubber along with tires of all other manufacturers are tested. The results are passed along to "U.S," and other tire makers.



Official Photo U.S. Army Air Force

THE PLASTIC MEN ... The Aero-Medical Lab studies the effect of high altitudes and low temperatures on flying personnel. Using plastic men like these, designed by skilled anthropologists, after careful study of Air Force personnel measurements, the AAF tries out "U.S." clothing and footwear.



Official Photo U.S. Army Air Fore

PROPELLER TESTS ...On this 6,000 horsepower electric whirl rig, the Propeller Lab applies the torture test to the latest types of propeller equipment. On these whirl rigs, United States Rubber Company's latest development for the elimination of ice on propeller blades gets an accelerated adhesion test,

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Courtesy Consolidated-Vultee

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in the Laboratory in Service Tests and in Combat

There has been no guesswork about U.S. Royal Airplane tires. Every tire in the line has been tested in the laboratory, tested again under the closest observation . . . and then subjected to the most severe test of all . . . actual service.

The U.S. Royal Block Tread has proved itself on fighters, bombers and commercial airliners on almost every kind of landing strip . . . on our airports at home and on emergency landing fields in Africa, Italy and the South Pacific. Scientifically engineered for the greatest traction and serviceability, the U.S. Royal Block Tread is a standard among airplane tire designs. With the switch to synthetic rubber treads, the U.S. Royal Block Tread is again proving its stamina.

The U.S. Royal Ice Grip with its positive, non-skid grip on icy runways, the U.S. Channel Tread and the U.S. Royal Plain Tread nose and tail wheel tires each does its own specialized job safely and dependably on test...and in service.

SERVING THROUGH SCIENCE



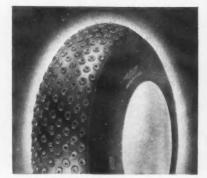
TO SPEED THE VICTORY



U.S. ROYAL SMOOTH CONTOUR TAIL WHEEL TIRE . . . Like every U.S. Royal Airplane tire, the tail wheel tire is available in Static Conductor Construction to protect the plane and crew from static shock. Specially designed for the stresses and strains of tail wheel service.



U.S. ROYAL SMOOTH CONTOUR BLOCK TREAD . . . The sharp edges of the U.S. Royal Block Tread protect against either forward or lateral skids...give sure-footed safety in landings and take-offs and de-liver long, dependable service. It is the leader of the "U.S." Airplane Tire line.



U.S. ROYAL SMOOTH CONTOUR ICE GRIP . . . This radically different type of airplane tire tread design originated by United States Rubber Company has proved in tests on ice covered landing fields its ability to cut through ice and bring the plane to a safe, sure stop.

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RUBBER COMPANY

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Diamond T Production Zooms to High Level

(Continued from page 21)

Among the major sub-assembly departments and stations which are found in profusion, serving the final assembly lines, are large scale operations for the preparation of bodies, for instrument panel wiring, for wheel and tire mounting, etc., etc.

Despite the fact that major components for the military vehicles are purchased from outside suppliers, Diamond T machines a great variety of small parts such as brackets, levers, and all manner of chassis elements of this character. Designedly they constitute a relatively simple machine shop operation. Such parts are handled in a small machine shop, equipped principally for drilling and boring. A number of the familiar Cincinnati milling machines are found here for handling milling operations. Too, there is a new horizontal broaching machine to facilitate keyseating on all manner of parts.

Finally, it may be of interest to note that the well-organized domestic service department which has been responsible for taking care of the needs of Diamond T's fleet operator customers, is still very much active, this department also carrying the additional load of handling certain military requirements as well.

The Military Service Parts Division, mentioned earlier, is an integrated unit occupying two large modern buildings in the Clearing industrial district, several miles southwest of the main plant. In these buildings are combined the receiving, packing, storage and shipping facilities for replacement parts and units, involving the accurate handling, moisture-proof packing, labeling, stencilling and shipment of a train-load of several hundred thousand pieces each week. Approximately 140,000 sq ft of floor area is in active use, and more than 650 employes, mostly women, are required to maintain this volume of output.

Large units are individually handled and processed. The smaller parts such as gears, bearings, valves, rings, etc., are first treated in a mammoth semiautomatic combination washer and dip machine. A conveyor chain which requires approximately one hour to complete its cycle, operates continuously, carrying parts suspended from hooks or in baskets, depending on their size and shape.

First stage is through a Mahon power washer employing an alkaline solution to remove both contamination and any previous protective coating of oil or grease. The conveyor then passes on through a double rinse and in front of an operator with an air nozzle who clears out interior cavities. Next stage s the drying oven and then into the bath of rust-inhibiting oil solution which air-dries to a thin but tenacious protecting film.

These lightly coated parts then are removed from the machine and transferred to conveyor belts which pass between two lines of girls. Here the parts are individually wrapped in moistureproof Celanese fabric which is 100 per cent acid and alkali free. Next procedure is a wax spray for the smaller parts and individual wax dipping for larger units. The spray machine employs a wire mesh conveyor belt which

provides for complete coating from multiple jets above and below.

After inspection, the parts are placed in cartons carrying suitable identification and transferred to temporary storage. There are three main storage sections of bins providing complete segregation of parts for the half-tracks, the 4-ton 6 x 6 and the tank hauler. Continuous inventory control is maintained with individual card index systems for each group.

The foregoing word picture, touching upon the highlights of this interesting operation, has been supplemented by an excellent group of illustrations taken as a sampling of many activities.

YES ... WE MAKE LAMINATION DIES!

... for laminations of continuing accuracy!

Few tool shops have either the equipment or the "know how" to turn out lamination dies. But, here at ELECTRIX, we possess both; employing them most efficiently to produce dies that meet the two major requirements for tools of this type . . . precision and long life.

The lamination die shown above is a typical example. Accurate to .0005, it will produce stators needed for precision assembly and stand up under hard, prolonged use. Many thousands will be blanked as accurately as the first.

If you need fine lamination dies, we'll welcome your inquiry. Write us - TODAY! ELECTRIX

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usively through eacetime engineers of soft-rubber con-ectors for electrically-operated quisment, sold exclusively through L. S. RUBBER CO.

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KOLD-HOLD ... Co-Pilot

Performance builds the confidence of our fighting pilots in their ships . . . but, long before enemy objectives are sighted, PER-FORMANCE is demanded in the testing of vital instruments and materials. . . KOLD-HOLD Sub-Zero equipment meets this challenge in assuring accuracy and dependability.

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Have a Cold Processing Application:

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Require Temperature Testing Units with pressure and humidity control:

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Know that Cold Temperature Processing Is Vital to Modern Production Methods: Then you can use KOLD-HOLD'S Sub-Zero Industrial equipment. Machines from 2 to 400 cubic feet and -100° F. to $+200^{\circ}$ F. temperature range.

KOLD-HOLD Stratosphere and "Hi-Low" Machines will do a specific job for you, accurately, thoroughly, rapidly and economically.

Hundreds of important War Production plants using KOLD-HOLD low and dual temperature machines daily demonstrate that cold processing is one of the foremost time savers of modern manufacturing.

• KOLD-HOLD units are productioneered* to YOUR specific problem. . . Catalog S-Z 431 illustrates many types of machines available now. Write for your copy today.



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B-17 Spot Welding Substitutes Riveting

(Continued from page 40)

standard shop practices.

- Pre-cleaned—Hot soap solution, Airlion #81V (3-6 oz/gal), temperature range 160 F. to 180 F.
- Hot water rinse—pH maintained from 4.0 — 6.8 by addition of chromic acid (CrO₃), temperature range 160 F. to 180 F.
- Etch—Oakite 84a (5-7 oz./gal. in water), temperature range 160 F. to 180 F.
- 4. Warm water rinse—to remove all traces of etching solution.

All cleaning, rinse and etch tanks are provided with air agitation for maximum cleaning efficiency.

Welding was accomplished Federal Condenser-Discharge equipment and standard shop machine setups. On these assemblies, no difficulties were encountered either in the assembly or spot welding operations. Although these assemblies were designed for riveting, they proved readily adaptable to assemble by spot welding without design changes. The use of bare 24ST aluminum alloy in sheet and extrusion form tends to restrict the use of spot welding, since the finish requirements necessary to protect this material against corrosion necessitates additional handling operations. However, when assemblies are to receive anodic treatment or when 24ST Alclad material can be substituted for the bare stock, such restrictions are eliminated.

Significant results of this investigation were: first, the appointment of a spot welding committee to survey other riveted assemblies for possible conversion to spot welding, and, secondly, the approval of specifications covering the requirement for the substitution of the spot welding method without drawing changes.

The need for such a specification was apparent since the engineering hours required to change drawings in the conventional manner were not available. Also, in many instances, it was considered advisable to call out spot welding as an optional method or assembly, so that in the event that assemblies would be sent to outside plants without adequate spot welding facilities, the parts could be riveted. With the approval of this specification, spotweld substitutions can be made merely by the addition of notes to the drawing which specify the rivets which may be replaced. It is not necessary that spot-weld patterns be shown since the specification covers the edge distance, spot spacing and multiple row requirements. Engineering hours required to make such changes are reduced to a minimum and this specification also allows the assembly to be converted to spot welding at any point convenient to production.

Modernized Bronze Bearings • Methods perfected through years of experience, special equipment designed by our staff, and exact scientific control over all operations are combined by Bunting to produce the unprecedented Bronze Bearings necessary in many modern applications. Uniform physical properties and previously unattempted tolerances are obtained in volume production by modern manufacturing methods plus constant extensive research. With Bunting it is not what Bronze Bearings can you get, but what specifications do you need... The Bunting Brass & Bronze Company, Toledo, O. Warehouses in Principal Cities.

May 1, 1944

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When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

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Hills-McCanna Magnesium Castings

(Continued from page 32)

head snd delivery conveying equipment. Rollover machines are operated in series of two or more; the cope on one machine, the drag on the other. One molder or group of molders operates each machine, the mold being closed by helpers.

In the East bay are small squeezer holding machines for handling comparatively small castings. Because of the nature of the work, no overhead sand conveying equipment is necessary here. The sand is supplied to the molders by laborers and the molders place the sand in the mold by hand. The pattern also is removed manually rather than mechanically.

Following molding and pouring, the castings go to the knockout station; then to rough inspection, from which the accepted castings are routed to the rough cleaning department. Rejected castings are returned to the melting room. The cleaning department is equipped with some outstanding items of modern equipment, including Wheelabrator Rotoblast and Tumblast machines; a battery of three heavy duty

Tannewitz band saws for removing gates and risers; and a battery of Hydro-Whirl cleaning booths made by the Peters-Dalton, Inc.

Following this preliminary heavy cleaning, the castings proceed to the finish cleaning and polishing department for the final burring, filing, buffing, and polishing operations. All of the burring and filing tools used in this department are driven by Kellerflex heads of flexible shafts.

Some of the customers provide massive "jigging" fixtures through which the castings are processed before shipment. This provides an opportunity for checking the entire casting dimensionally as well as to machine certain locating spots which assures alignment in the customer's production fixtures. Such locators are produced by spot-facing or counterboring while in the jigging fixture.

Core making is one of the major activities in this foundry and occupies a good part of the facilities. Cores are made by hand or in machines, depending upon their size; and certain cores are made in new International coreblowing machines. A large battery of baking ovens is employed in this de-

partment.

Heat treatment of magnesium castings is another of important technical problems under the watchful eye of the metallurgical department. The temperature and time of exposure are extremely critical and subject to exact specifications and control. In addition, it has been found that the method of racking castings also has a marked effect upon the result achieved and operators are instructed as to the established racking procedure.

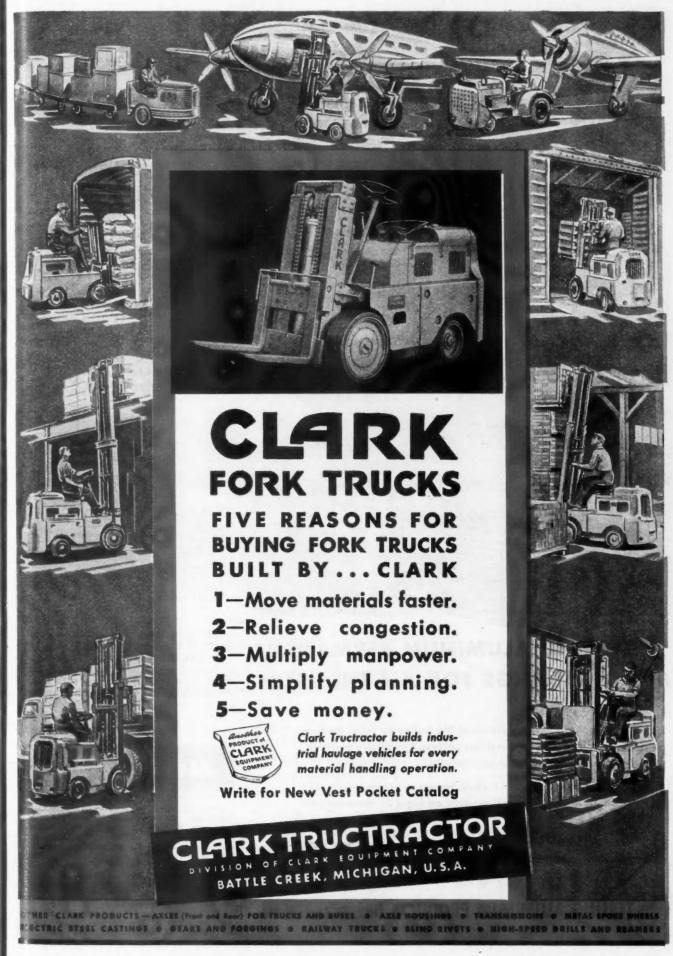
Materials handling equipment has been provided wherever heavy manual tasks can be eliminated. Thus the ladles are transported to the molding room on an overhead rail system. Molds are assembled and poured on gravity roller conveyor lines. Cranes and hoists are provided at strategic points.

Although practically no machining is done on the magnesium castings produced here, there is a sizable machine shop normally used for machining the line of valves and pumps supplied by the company. Among the equipment found here are familiar machines such as-Foster and Gisholt lathes; a large Bullard V-T-L; Cincinnati milling machines; Kearney & Trecker Milling machines. The Bullard is employed almost exclusively for removing the heavy gates and risers on the variety of landing gear wheel castings.

Hills-McCanna holds great promise for the future of magnesium in postwar operations and is prepared to offer the automotive industry the benefit of its valuable background of experience in the selection of applications, in the design of parts best suited to magnesium foundry practice, and finally, in the production of magnesium castings of highest quality compatible with economy.



4220 N. Knox Ave., Chicago 41, U.S.A.



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Special Equipment Operates Automatically

T HE Lyon-Raymond Corporation, Greene, N. Y., recently designed and built a special piece of equipment for automatically feeding processed parts to a pickling bath. It is not a standard product of the Lyon-Raymond Corporation, but was built to suit the customer's requirements.

In this operation a large, empty, wire basket is placed on a tilting conveyor table. This table is tilted to place the basket in a more convenient position for loading. The table is then hydraulically lowered to its horizontal position

T HE Lyon-Raymond Corporation, and the basket of parts rolled onto the Greene, N. Y., recently designed and elevating table.

The operator then presses an electric push button which starts a sequence of the following operations, all of which are automatic until the table returns to its original lowered position.

The table elevates hydraulically 38 in. and during its elevation turns 90 deg. Upon reaching its full elevated height, it automatically starts a pusher which travels across the table and pushes the basket off the table onto another rolled conveyor. The basket is

then pushed into the pickling bath. The pusher returns to its original position and the table lowers and turns 90 deg back to its starting position.

During this sequence of operations the operator on the right side of the elevating table has tilted his table hydraulically, loaded his basket, lowered it hydraulically to its horizontal position and is ready to push the basket onto the elevating table as soon as it reaches its lowered position.

The elevating and turning of the table, the pusher operation and the return of both to their original positions, are all automatically accomplished in 30 sec. These operations are obtained hydraulically, controlled by limit switches and solenoid operated hydraulic valves. The only manual operation of this sequence is pushing the starter button at the beginning of the cycle.

Geargrind Performs Two Operations at Once

In grinding an overrunning clutch for an aircraft supercharger part, one geargrind machine, Type SG-11, equipped with dual grinding wheels and



Dual Grinding Wheels on Geargrind Machine

a special trimmer, grinds both flat and radius at the same time.

Originally these two operations were performed separately, involving either break-down and set-up when both were performed on the same machine, or the use of two machines on a production basis.

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BOOKS ···

First edition of a practical, elementary treatment of timestudy for foremen is found in a book entitled "TIMESTUDY FUNDAMENTALS FOR FOREMEN" by Phil Carroll, Jr. Its purpose is to give foremen a clear understanding of the principles of timestudy so as to enable them to approach the matter sympathetically and to sell the idea to their men. A study of the text material should provide the foreman with a working knowledge of principles which lead to better economy to the advantage of the workers as well as the owners of a business. The book is published by McGraw-Hill Book Co.



STERLING ALUMINUM PERMANENT MOLD CASTINGS FOR ALL INDUSTRY

Sterling has for years produced fine pistons by using a unique and proven, patented molding process, fine quality materials, and unsurpassed skill in workmanship.

In addition to our piston factory, we are just completing a very modern foundry that will produce all types of aluminum permanent mold castings.

Our staff of engineers will be glad to assist you with your engineering problems. Their experience may be valuable to you.



METAL IS CUT! THE AND

This new, high-speed DeWalt will out-perform the ordinary types of "light metal" cutting machines you have heretofore been able to buy to do comparable work. It cuts metal fast, accurately, and with greater safety. And it's built to last.

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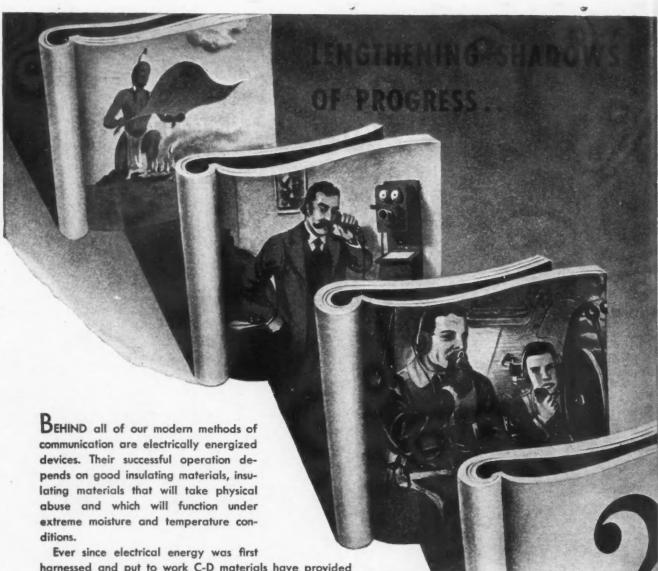
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One manufacturer who has a battery of these high-speed DeWalts, is cutting S.A.E. 52100 solid bearing steel into 15/16" lengths—at the rate of 600 to 650 pieces per hour per machine, using women operators. The machines have already cut 4,500,000 pieces and are still going strong.

DeWalt engineering service helped this customer step up production. What is your metal cutting problem? We manufacture a complete line of metal cutting machines, and may be able to help you. Call in one of our engineers. Wire, write or phone DeWalt Products Corporation, 5801 Fountain Avenue, Lancaster, Pennsylvania.

RADIAL POWER SAWS
LANCASTER PENNA.

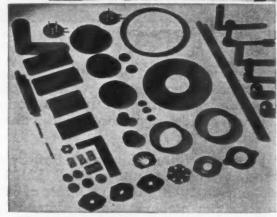


Ever since electrical energy was first harnessed and put to work C-D materials have provided good insulation. The development of better insulating materials has been the constant goal of the C-D laboratory. The success of C-D's efforts have been the lengthening shadows which have forecast the phenomenal advances which this country has made in the field of communications.

1st DIAMOND Vulcanized FIBRE; then DILECTO, a moisture proof insulation; 3rd VULCOID, which combines to a remarkable degree the desirable properties of both DIAMOND Fibre and DILECTO; 4th MICABOND—Mica insulation in its most usable form and now DILECTENE, a pure resin plastic especially for U-H-F insulation.

C-D engineers have helped solve thousands of insulating problems. They have accumulated a wealth of "know how" which is at your disposal to help solve your electrical insulation problem.

DISTRICT OFFICES: New York - Cleveland - Chicago - Spartanburg, S. C. West Coast Rep., Marwood, Ltd., San Francisco - Sales Offices in principal cities

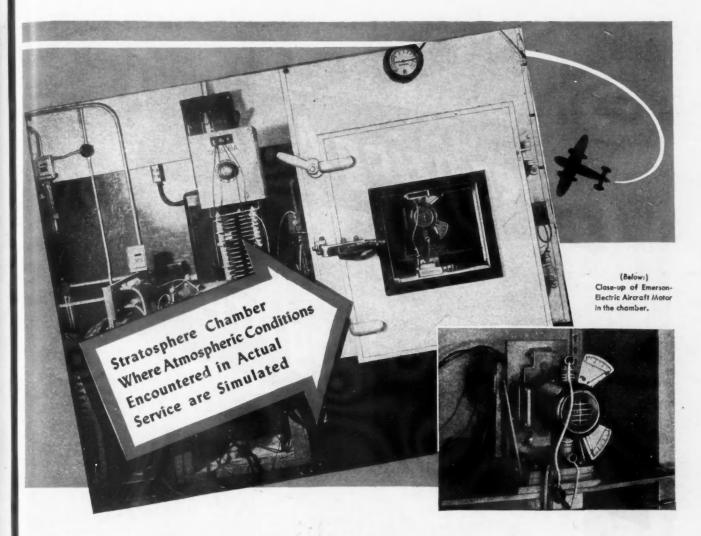


C-D products include THE PLASTICS... DILECTO—a faminated phenolic CELORON—a molded phenolic: DILECTENE—a pure resin plastic especially suited to U-H-F insulation... THE NON-METALLICS, DIAMOND Vulcanized Fibre: VULCOID — resin impregnated vulcanized fibre: and MICABOND—built-up mica insulation. Folder GF describes all these products and gives standard sizes and specifications.

CH-43

Gontinental - Diamond FIBRE COMPANY

Established 1895. Manufacturers of Laminated Plastics since 1911—NEWARK 2 • DELAWARE



Down-to-Earth Testing of High-Flying Motors

Electric motors for combat aircraft must be able to "take it" in an extreme range of atmospheric conditions. The stratosphere chamber shown above is used for three main purposes:

- To determine brush life and observe commutation under high altitude atmospheric conditions.
- 2. To test the acceptability of ball-bearing and gear greases over a wide range of temperatures.
- 3. To determine the effectiveness of grease seals at the low pressures and temperatures encountered at high altitudes.

Full particulars of production, inspection and testing are given in a new booklet, "Emerson-Electric Aircraft Motors".

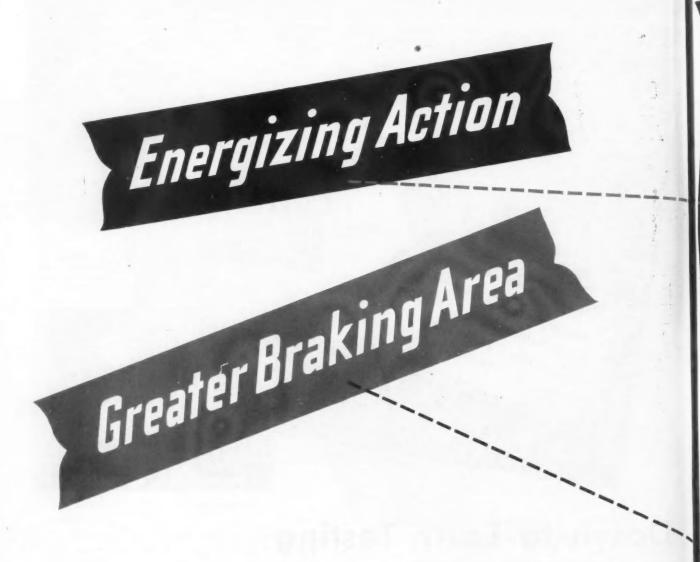
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ARMY E NAVY

EMERSON-ELECTRIC AIRCRAFT MOTORS are made for gun turret drives, hydraulic units, fuel pumps, actuators, winterizing units, communication systems—also with built-in gear and magnetic brake.

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Spell an Advance in Brake Performance long sought by makers of cars, trucks, buses, tractors and aircraft

● Through the Lambert energizing elements, momentum is harnessed and utilized to provide additional braking power. Result, less pedal pressure... greater braking efficiency... a safer brake! Add to this the inherent advantages of the disc brake with its greater braking area... its superior distribution of pressure... its equal efficiency in controlling both forward and backward

motion...its elimination of drum weight and scoring...and you have a few of the reasons why the Lambert Brake is the answer to the demand for a superior post-war brake. As a standard equipment brake, it has already proven a distinct revolutionary advance in brake performance. It's ready now for your engineering department's investigation and tests. Auto Specialties Mfg. Co., St. Joseph, Michigan.

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AIR . HYDRAULIC . MECHANICAL . DISC BRAKES

ENERGIZING ELEMENT

consisting of power roller and insert

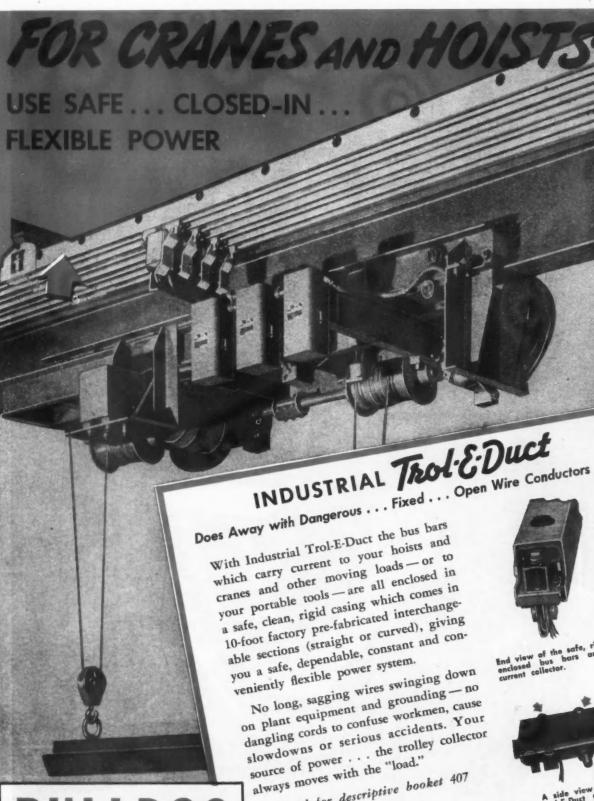
FRICTION RING

PRIMARY

The application of initial power to the primary disc brings it in contact with the revolving friction ring which imparts a slight rotary motion to the primary disc, causing the rollers or balls of the energizing element to move up the incline of the insert, producing additional brake power.

SECONDARY DISC

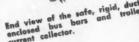
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BOX 177, R. PK. ANNEX DETROIT 32, MICHIGAN BullDag Electric Products of Canada, Ltd., Toronto, Ont.



Field Engineering Offices in All Principal Cities





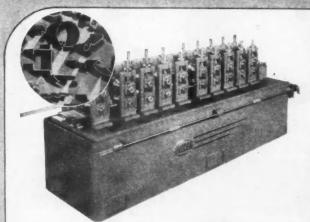
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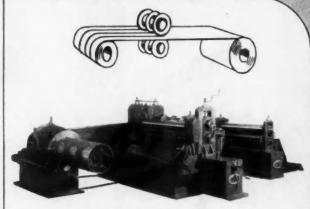
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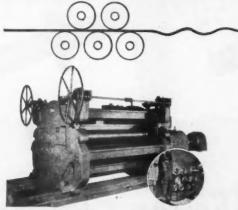
10U GET THE IMPROVEMENTS FIRST FROM Woder



ROLL FORMING MACHINES



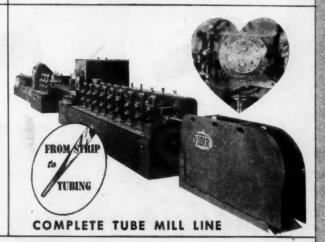
SLITTING LINE



HEAVY DUTY PLATE LEVELER

RDS

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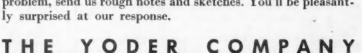
MEET THE NEW PROBLEMS with YODER

Problems! Problems! Problems! Problems!

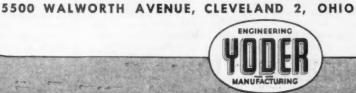
When it is a high-production metal working machinery problem . . . call on Yoder's engineering and manufacturing facilities.

Practical plans for solving such problems can best be formulated when specialized experience is brought to bear upon them. Rely on Yoder's thirty years of experience to create a machine with a plan of action built into it that will help you to meet the new conditions.

We have a general bulletin that presents a large variety of our regular line of machines. However, if yours is a special problem, send us rough notes and sketches. You'll be pleasantly surprised at our response.







METAL WORKING MACHINERY



Cold forgings—just a few of the unusual shapes and sizes from the "good, rich earth" of Allied craftsmanship! Only years of careful cultivation of precision machinery and workmanship could make them possible.

Produced in one piece, from a coil of steel wire, Allied cold forgings are taking part in America's march to victory—in tanks, tractors, amphibians, jeeps, airplanes and other equipment of war. If you are producing materiel for victory, the unusual strength, flexibility of

design, and precise dimensions of these and other parts which are produced in volume by Allied Products Corporation may solve some of your production problems.

"IT'S AN ALLIED PRODUCT!"... Allied Products Corporation and its divisions, Richard Brothers and Victor-Peninsular, in Detroit and Hillsdale, Michigan, also make: The original, patented R-B Interchangeable Punch and Die; sheet metal dies; plastic molds; jigs and fixtures; precision hardened and ground parts; and other special products.

ALLIED PRODUCTS CORPORATION

All four plants have now added a star to their Army-Navy "E" pennants

"Grow More In '44"

—that's the motto for America's victory gardeners this year. The food situation continues urgent, and the government calls for 22 million victory gardens. Let's all pitch in and help grow our own food. NOW is the time to PLAN a prize victory garden!

Executive Offices: 4646 Lawton Ave. Detroit 8, Mich.

Simmonds PUSH win the YELLOW Air Force Winterigation

Controls
Dot of Army
Approval.

As a result of their proven performance under severe

Arctic conditions, Simmonds-Corsey Push-Pull Controls have won new honors—the Yellow Dot of approval by the U. S. Army Air Force Winterization

Program. Thousands of hours of operation at temperatures down to 65 below zero have confirmed laboratory experiments which indicated the low frictional qualities of these controls.

More than 250,000 of these precision-built controls have been installed on the fighting planes of the United Nations, including the leading U. S. military and transport aircraft. Because of their wide range of applications, they are being used also for marine and automotive units.

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Simmonds Equipment Flies
With Every Type of Allied Aircraft

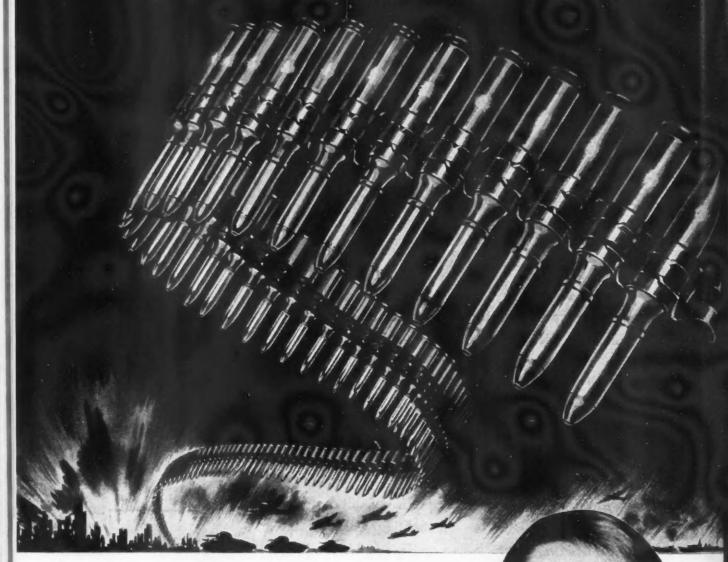
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Once we made springs-more than anybody else. We're still making them, of course - for guns, trucks and jeeps. But in addition we're making miles and miles of shells and ammunition belt links to put the blast on enemy planes, tanks and troops. And we're making a whole host of other essential items. We're head and shoulders in this war to design, build and produce in volume anything that will in any way speed the day of Victory.



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L. A. YOUNG SPRING & WIRE CORPORATION . DETROIT 11, MICHIGA CHICAGO, LOS ANGELES, OAKLAND, CALIF., TRENTON, N. J., TULSA, OKLA. And In TORONTO and WINDSOR, CANADA

CLARK Forged HEAT TREATED AXLE HOUSINGS

Built to do a BETTER JOB

Here's Why

MAXIMUM STRENGTH WITH TOUGHNESS AND

DURABILITY . . . ONE PIECE, TUBULAR BEAM

. . . FORGED AND HEAT TREATED . . . NO

WARPING OR DISTORTION . . . LESS UNSPRUNG

WEIGHT . . . MINIMUM MAINTENANCE . . .



STRONG-TOUGH-DURABLE . . .

... these qualities are engineered into the Clark one-piece tubular forged ... these qualities are engineered into the Clark one-piece tubular forged housing; the most widely used truck axle housing in the world. Briefly stated, some of the reasons for this leadership are: 1. Made of high carbon steel, specially treated. nousing; the most widely used truck axie housing stated, some of the reasons for this leadership are: 1. Made or night carbon steel, specially treated.
2. Added parts are welded on before heat treating to make a homogeneous structure.

- 3. Sections controlled to eliminate localization of stresses. 4. Grain flow controlled throughout to improve fatigue qualities. S. Rigid support of differential carrier assembly.

 S. Carrier assembly.
- 6. Correct wheel bearing alignment.

- The many advantages of this axle housing begin with the steel from which it is ing pegin with the steel from which it is labricated. Steel mill metallurgical laboratories and Clark engineers collaborated to

develop the most desirable chemical and physical specifications. Once the steel is in physical specifications. Once the steel is in the Clark plant, it is subjected to the most signed angular to the most signed angu rigid control at every operation. Critical in-One of the first operations is swaging the spections are frequent.

steel tubing to provide a proper metal secmeet tubing to provide a proper metal sec-tion in the load carrying area. Next, heat is applied to form the banjo and wheel end.
sections. Spring pads and flanges are then

7. Flexibility without permanent set. welded in place. Next the complete housing weided in place, next the complete housing is heat treated, quenched and drawn to is neut treated, quenched and arawn to provide a homogeneous structure capable of carrying maximum loads.

Strong, tough, durable—it is no wonder that this husky unit has won high praise from foremost automotive engineers as a most effective automotive engineers as a disconnective and dependable load-carrygiving long lived usefulness ing member . . . giving long lived userliness and trouble-free low-cost performance.

Here's a thoroughly sensible, practical idea: ing member . riere s a moroughly sensible, practical idea:
arrange an axle discussion—your engineers

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METAL SPOKE WHEELS

One of a series of articles on the preparation of metal surfaces for protective finishes

INFORMATION VITAL TO WAR PRODUCTION

A MATERIAL AID TO INCREASING OUTPUT AND MINIMIZING REJECTIONS. ORDNANCE INSPECTORS AND MANUFACTURERS CONTRIBUTING TO WAR PRODUCTION BUT WHO ARE FABRICATING METALS FOR THE FIRST TIME WILL FIND THESE ARTICLES ESPECIALLY VALUABLE.

A Chemically Clean Surface! What is Clean and Why Necessary?

A clean metal surface is a surface freed of all *invisible*, as well as visible contaminants. Only chemically clean metal surfaces will retain a satisfactory protective coating of paint or lacquer indefinitely.

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The metal industry, after many years in research endeavoring to prevent premature failure of paint on metal surfaces, found the chief cause of failure to be improper cleaning in preparation for paint. Serious difficulties are being experienced today with protective finishes for war materials which must be protected to withstand all kinds of climatic conditions.

Proper Cleaning Essential

Proper cleaning is more than the removal of visible rust, scale and oxides, or even the microscopic particles remaining in the surface pits—the rust producers and other invisible contaminants must be removed or so changed that they will not develop under the applied finish.

It is unsafe to judge the condition of the cleaned surface by its uniformity and apparent "cleanness" which often have been the criteria by which contractors and inspectors have judged the merits of the cleaning cycle. Many materials will give a clean and uniformlooking surface to metal, which has been freed of visible impurities, yet will leave it highly unsafe to paint. Addition to the rinse water of alkaline materials will generally do just this. Among the alkaline materials that are added to rinse baths are caustic soda, soda ash, sodium chromate, mixtures of sodium chromate and sodium bicarbonate. If the metal has been cleansed by an alkali process and then rinsed in an untreated water bath, there is bound to be an alkali accumulation retained which will be harmful to organic coat-

The suitability of a surface to take and hold a protective coating cannot be assumed from the appearance of the metal surface. The invisible impurities are often as harmful as the visible ones. These impurities, carried into the rinse from the cleaning bath, include alkalies and alkaline salts (always present in the water), salts of iron (such as the chlorides and sulphates which remain from pickling operations) and soluble material, such as soap, sulphated or sulphonated wetting or emulsifying agents, etc.

ADVERTISEMENT

A Safe Type of Cleaner

Deoxidine is the original phosphoric acid type cleaner and is highly desirable and efficient. Deoxidine contains, in general, phosphoric acid, grease solvents, wetting agents, emulsifying agents, and sometimes inhibitors of acid attack on steel. It is formulated for use hot or cold, of various acid

strengths and with various amounts of grease-removing agents so that it may be used for the removal of all but the heaviest grease.

heaviest grease.

Use of the correct type of Deoxidine (whether or not preceded by a preliminary cleaning in alkali or by pickling in sulfuric or hydrochloric acid) affords a method for removal of visible impurities which leaves the least amount of invisible harmful residues.

Traces of phosphoric acid left behind are not harmful to paint life. Further—work cleaned with Deoxidine is less sensitive to the final rinsing than work cleaned with, for example, alkalies or the usual pickling acids. (Alkali cleaners will not remove rust or scale.) The importance of the final rinsing operation cannot be minimized.

This will be discussed in a future



is adapted to the cleaning of aluminum, aluminum alloys, steel, in fact, all metals (except zinc and cadmium) in preparation for paint, lacquer or varnish finish.

Deoxidine in peacetime made possible a lasting paint finish on steel automobile bodies. Refrigerator manufacturers and other metal fabricators were quick to recognize its advantages.

Today Deoxidine is active in War Production, insuring, through proper cleaning, a lasting protective paint or lacquer finish to much ordnance, aviation, army and navy equipment.

Tomorrow, when world peace is again restored, Deoxidine will solve many metal cleaning problems in new fields where its efficiency is being demonstrated.

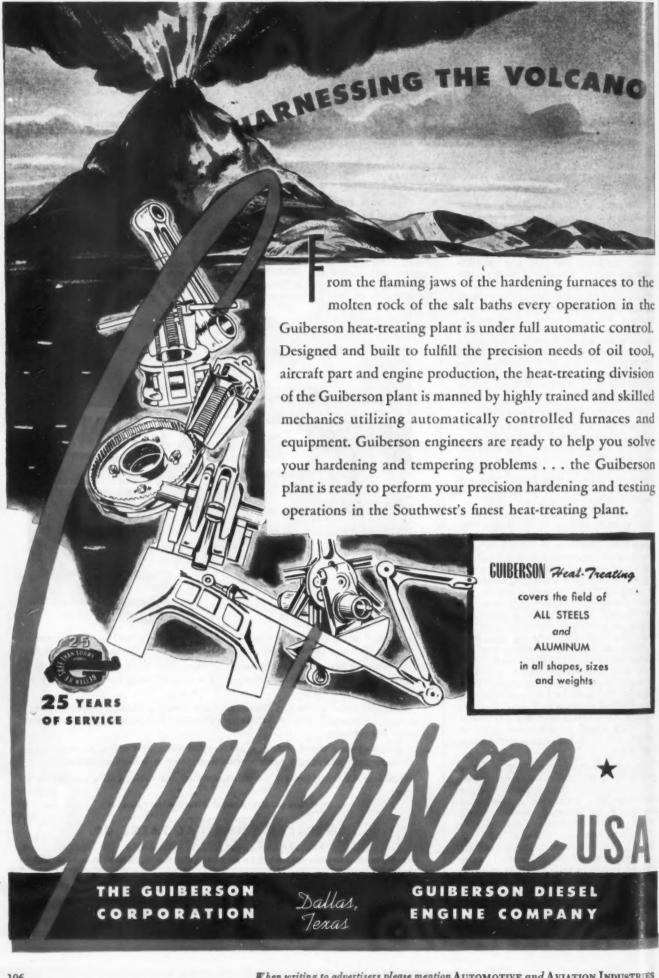
Deoxidine Cleaning Process has been standard for more than a quarter of a century.

Manufacturers of Inhibitors & Metal Working Chemicals

AMERICAN CHEMICAL PAINT CO.

Note-West Coast Plants may address inquiries and orders for prempt delivery to Leon Finch, Ltd., 728 East 50th St., Les Angeles, California

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Please send me general Technical Service Data Sheets on							
Name			Т	itle			
Name							
Company						□ De	xidine K-5





The American Way

PROVEN in war... Ready for PEACE

Precision work at a mass production rate-plus the extra economy of doubled output per broach sharpening! This is a typical example of the application of American's complete broaching service to a production problem. American Broach & Machine Company engineers set up this operation to finish the sides of uni-

An American SB-42-10 surface broaching machine is used, equipped with a special receding table incorporating two selective work positions. Extra wide broaches, more than twice the part width, make possible the use of one half of the broaching surface at a time. When this half becomes dull the position may be changed so that the remaining half continues the operation. Twice the. number of parts per broach sharpening are obtained, reducing production cost and time, maintaining exceptional finish and accuracy!

American BROACH AND MACHINE

ANN ARBOR, MICHIGAN BROACHING MACHINES PRESSES BROACHING TOOLS SPECIAL MACHINERY



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HYDRAULIC ENGINEERING





FROM CAMSHAFT TO COMBUSTION CHAMBER, Eaton products include parts for the complete valve assembly—Zero-Lash Hydraulic Valve Mechanisms, Mechanical Tappets, Self-Locking Screws, Valve Springs, Valve Seat Inserts, and Automotive and Aircraft Valves.

THE EATON ROTOR PUMP IS ENGINEERED AND MANUFACTURED BY THE WILCOX-RICH DIVISION OF EATON MANUFACTURING CO., 9771 FRENCH ROAD • DETROIT The remarkable efficiency at low speed of the Eaton

Rotor Pump . . . together with its ability to maintain

pressure at very low oil viscosity . . . makes it the perfect

mechanism for automatic transmissions. Here the

mechanism for automatic transmissions. Here the

pump will perform a triple function—maintain pressure

in the fluid driving member . . . provide servo power for

in the fluid driving member . . . and lubricate the

actuating the speed range shift . . . and lubricate the

transmission gears. The proven performance of the

Eaton Rotor Pump in today's military vehicles

foreshadows its successful use in tomorrow's trucks,

tractors, automobiles, and aircraft.



Speed up— AIRCRAFT RIVETING



TRIES

WHEN SHOULD VETERANS BE RETIRED?

In hundreds of plants today, many 15 to 25-year old Acme-Gridley multiple spindle automatics are in service. These machines were pulled out of retirement only because of war demands. They are effective but not very efficient—should be retired.

There are hundreds more of modern Acme-Gridley automatics making munitions and other war parts, machines perfectly capable of postwar jobs after they have been retooled and reconditioned.

Then there are the brand new Acme-Gridley automatics, both bar and chucking types, ready to start from scratch making parts to new production standards, faster and at lower cost than ever before.

So, it's the simple economics of competition, the fight for lower cost, that fixes the retirement age of machines for postwar parts output.

If you have obsolete Acme-Gridleys they should be retired—scrapped. If yours are recent war-worn models they must be retooled and reconditioned. For your protection and profit we offer the services of trained men, men who actually built and tooled the machines, ready to work with you on a guaranteed production basis.



ACME-GRIDLEY AUTOMATICS maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

The NATIONAL ACME Company



MACHINERY ORPORA

Machinery we're realists...and

we're keeping on building

heavy machinery, cannon, diesel

and steam engines, for NOW.

GENERAL MACHINERY

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RIES



The year before Pearl Harbor, WARD PRODUCTS CORPORATION manufactured and sold better than 90% of all aerials used by leading manufacturers of automobiles, radios and portable radios. That commanding position was made possible by superior designing ability, manufacturing knowledge and production efficiency.

That expertness of antenna manufacturing is today being totally applied to the war effort . . . and in wartime, as in peacetime, WARD is the leading manufacturer of antennas. The name WARD is found on aerials used on command cars, tanks, planes—on communication units of all kinds—on battle fronts all over the world. . . . The knowledge that is being gained from this wartime effort will mean new and improved products in peacetime. If the use or specifying of antennas is included in your post-war planning, look to WARD!





... and you cannot escape it!

PHOTO

This "Frozen-Action" photo pictures a force that is shaping the destinies of all mankind — now and for generations to come.

To our enemies it is a dreadful secret force that will one day bring them crying to their knees. Secret to them . . . because they have never fully understood it. Their warped minds could not possibly realize the extent to which American industry has mastered the art of cutting and working metals on a vast scale. Our enemies can neither equal nor escape this force — bred by generations of free enterprise.

To Americans, this force is the secret which has brought about the highest standard of living the world has ever known. When peace comes, it will be a key factor in building a better world.

Our picture shows Pratt & Whitney milling cutters at work. And there's a secret here — too. If you already use Pratt & Whitney small tools you know about it . . . about their keen cutting edges, long life, and dependability. If you are not yet a user of these fine tools — now is a good time to find out how they can help cut your costs in the highly competitive civilian production days which lie just around the corner. Get in touch with the nearest P&W branch office, where you will find expert engineers ready to co-operate by offering sound, economical solutions to your metal working problems.

Shown are two Pratt & Whitney plain milling cutters at work. The line of top quality small tools made by Pratt & Whitney includes a complete line of TAPS, DIES, REAMERS, GEAR CUTTERS, MILLING CUTTERS, DRILLS, ARBORS, PUNCHES, THREADING TOOLS, METAL SLITTING SAWS... and many others. Each one is made to the well known Pratt & Whitney standard of accuracy.

PRATT & WHITNEY

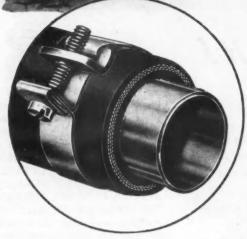
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CENTRAL UNIVERSAL HOSE CLAMPS IN





• Central Universal Hose Clamps are used in the production and servicing of Army and Navy trucks, jeeps, half-tracks, amphibians, cranes, bull-dozers, etc.; also as original and replacement equipment on road-rollers, farm machinery, portable saws, searchlights, marine, diesel and gasoline engines, and for all types of radiator hose.

SEND FOR FREE SAMPLE OF CENTRAL UNIVERSAL CLAMPS

THE Half Track DEPENDS ON CENTRAL CLAMP-POWER

Central Universal Hose Clamps are an important part of America's global war machine. Standard equipment for Army and Navy combat vehicles, they are supplying vital clamp-power with unfailing dependability.

These Clamps are strong enough for every production and service requirement. They are precision built of rustproof, extra heavy rolled steel . . . self-locking . . . cannot strip or loosen . . . able to withstand abnormal pressure, stress, strain and vibration. They also are easier to use in hard-to-get-at places, and can be attached or removed without disconnecting the line.

Furnished flat, one length will fit hundreds of diameter sizes — because Central Universal Hose Clamps are 100% universal!

CENTRAL EQUIPMENT CO.

900 SO. WABASH AVE. CHICAGO 5, ILL.



New GAS SCHOOL trains workers to fight industrial gases

Every day a large steel plant produces millions of cubic feet of dangerous gases—blast-furnace gas, coke-oven gas, carbon monoxide, ammonia gas, and the like. Now, with thousands of new workers, protection against the gas hazard is more important than ever before.

To safeguard workers more fully, Bethlehem is now operating what is believed to be the first and only industrial gas school in any American steel plant.

Climax of the course comes when each man performs physical work while wearing gas-protective equipment in a gas-tight room filled with white clouds of non-poisonous but choking, stinging gas.

But before any man goes into the gas chamber he receives a thorough training in gas-fighting technique. He learns:

 How to use and maintain various types of masks and breathing apparatus.

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- How to choose the proper equipment for a given gas.
- Which industrial gases are dangerous and where they are likely to be found.
- 4. How those gases affect the body.
- How to revive a victim who has been gassed.

Then the trainees are ready for the test. They strap on a canister mask, "fresh-air" mask, or oxygen-breathing apparatus, and step into the gas-filled room. They crawl through tunnels on mock rescues, climb over



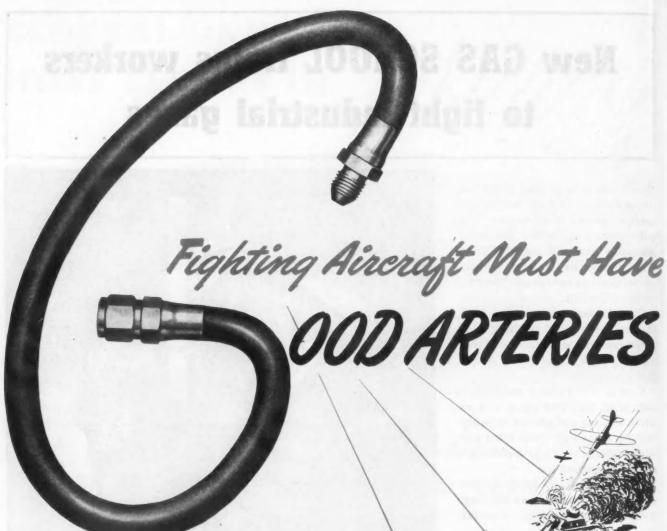


• Men at work in gas-filled room, in Bethlehem gas school. The instructor watches through a window, directs their efforts over a public-address system. Gas used is unpleasant but not harmful. This test trains men to meet emergencies and accustoms them to breathing through protective equipment.

hurdles, load wheelbarrows, repair pipes, and do many other kinds of simple, every-day tasks, to accustom themselves to the strange sensation of physical exertion while breathing through protective equipment. The gas in the chamber is not dangerous, but highly unpleasant, so that if a man decides not to bother with his mask and slips it off, one whiff will send him out of the chamber choking and wiping his eyes.

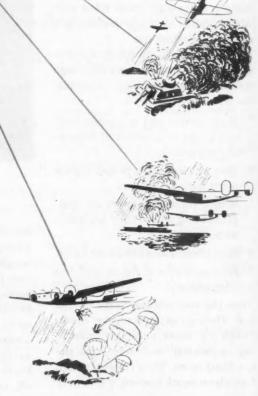
Men from all departments who may have to cope with industrial gas are given this training; men from blast furnaces and coke works; men from labor and construction, combustion, fire and police departments. Men who normally work together on the job are trained in teams so that they can go into action as a unit in an emergency.

The school is a marked success. Men are rapidly learning to combat dangerous industrial gases, to use the proper protective equipment and, when necessary, to work safely and easily in gaseous atmospheres. Safeguarding of workers against industrial gases is one of many ways in which Bethlehem's work in safety promotion is helping to maintain output at record-breaking levels. Whatever contributes to the health and the safety of workers helps to increase the flow of weapons and supplies to our fighters overseas.



When the aircraft designer specifies Flex-O-Tube, he gives the future crew of that plane the best possible protection of their fuel, oil, hydraulic and instrument lines against the effects of vibration, twisting and wide temperature variations.

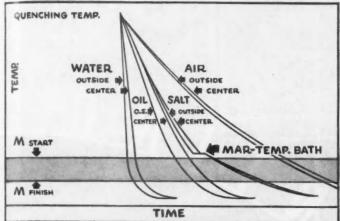
The designer recognizes that Flex-O-Tube Company is the oldest manufacturer of hose assemblies in the country; also that this Company has no other product. The Company's entire resources have always been devoted solely to the development and production of hose assemblies, and its engineers, with greater experience, are recognized as authorities in this field.



Flex-O-Tube

LAFAYETTE at 14th AVE., DETROIT 16, MICHIGAN Offices: CHICAGO FORT WORTH LOS ANGELES NEW YORK SEATTLE TORONTO, ONT.

TO AVOID DISTORTION-



18

WARPING -CRACKING -

Salt-quench

in Houghton's MAR-TEMP

The salt bath "interrupted" quench is attracting much attention these days. Metallurgists who have had trouble with conventional methods of quenching are adopting the salt bath—for Austempering, for the "isothermal" quench and for Martempering. They see the advantages of salt bath heat treatment all the way through—for heating up to austenitizing temperature, for quenching and for tempering where needed.

They use MAR-TEMP Salt, developed by Houghton for interrupted quenching, because of its stability, its low melting point, its rapid quenching speed through the critical zone, its fluidity, its easy removal from the work.

If you see a need for minimizing distortion and eliminating quench cracks, call in the Houghton Man.

HOUGHTON PRODUCTS for metal warking: CARBURIZERS QUENCHING OILS CUTTING OILS METAL CLEANERS RUST PREVENTIVES DRAWING COMPOUNDS

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SPECIALLY DEVELOPED to expedite the painting and baking of AIRCRAFT ENGINE CRANKCASES

In this modern aircraft engine plant, very definite economies have been effected in the finishing of crankcases through the use of automatic equipment, developed by Mahon engineers. Manual handling is almost entirely eliminated. Crankcases flow in a continuous stream past the painting positions and into and through the 4-compartment baking oven, automatically regulated to exact baking heats. A material saving in floor space has been achieved by locating the oven ten feet above floor level. As a protection to operators' health and to

insure faster, better work, the paint room is completely air-conditioned. A specially developed ventilating sys-tem floods and exhausts from this room more than 70,000 cubic feet of filtered and heated air per minute. So free is the air from overspray and fumes, women operators work without masks and in lightest colored clothing . . . Mahon engineers can modernize and economize YOUR finishing operations with equal efficiency. Let us show you how and why.

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Cleveland PNEUMATIC SHOCK ABSORBERS

• Mass discharge of carbon dioxide by this Cardox Airport Fire Truck quickly extinguishes airplane crash fires. The chassis for this unusual vehicle is built by Sterling Motor Truck Co., Inc. and is equipped with Cleco-Gruss shock absorbers. Cleco-Gruss units help the trucks stand the gaff of this wracking, emergency service.

Cleco-Gruss units are pneumatic-inflated like a tire. Of the extra heavy duty type, they are extensively used on large Army trucks. Cle-Air shock absorbers (hydraulic-pneumatic) are commercial units suitable for all types of buses, trucks, and trailers.

Write for detailed information

THE CLEVELAND PNEUMATIC TOOL CO.

AUTOMOTIVE DIVISION . CLEVELAND 5, OHIO

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Only by Broaching was this phenomenal Precision Production record possible





ON THE FARM FRONT

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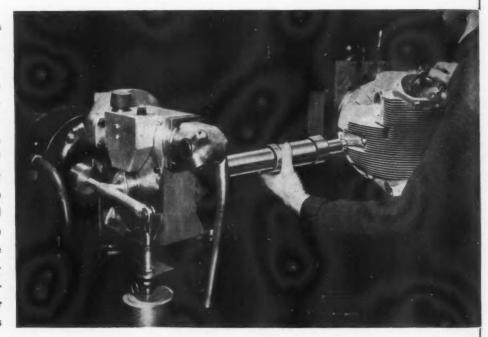
Supplying the nation's bread basket is one of the vital war tasks of the Form Front. Here, as on all other fronts, Bower Roller Bearings are carrying the rolling load—in tractors, plows, harvesting machines and every other implement that moves a wheel. This war is a war on bearings.

BOWER BERLER BLAPING COR

YOU CAN "SEAT YOUR BUSHING INSERTS"

gas-7ight and without damage to threads . . .

In this modern mechanism, a bushing is fed to the adapter; the sleeve advanced to where the bushing enters the nole. At 100 R.P.M. the bushing is mechanically spun until within a few threads of the bottom of the hole. At low speed, bushing is driven firmly against its seat until correct torque has been reached. The Scandia torque principle prevents overtightening of inserts, thereby eliminating the danger of cracked cylinder-heads during flight.



Scandia's TORQUE-MACHINES* are doing it—DAILY for America's finest Aircraft . . .

OUTSTANDING AUTOMOTIVE TORQUE MACHINERY FOR TINY STUDS TO GIANT

There is a definite advance toward economy and speedier production for Post-war automotive and aviation fields now being demonstrated under actual fast-production conditions in the building of motors for American aircraft. The time to acquire these improved units is now! Write for information . . .

* Manufactured under BRONANDER Patents.

Scandia Manufacturing co.

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For many of the established uses of cloth find, if you can, an adequate substitute. There is none because only a woven fabric drapes, folds, creases, holds stitching or adhesives and conforms to contour with a comparable degree of elastic tensile strength. Cloth is a structure distinctive in nature and when processed to special use, serves that use as can nothing else. Processing to purpose brings woven cloth in the forefront of postwar production materials.

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Coating means using the woven fabric as a structural base and covering and concealing the texture with a heavy bodied flexible substance spread on much as plaster is spread on lath. Coating materials are varied to secure differing appearances and properties. Many of these coatings fall in the plastic group. New coating treatments are being devised and greatly varied properties secured. Coating may be preceded by impregnating or filling.

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We urge you to consider CLOTH; and invite you to consult with us concerning possibilities and developments for your specific requirements.



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• You can depend upon these wires for uniformly good results in harizontal, vertical and overhead welds—welds that pass the most rigid tests for tensile strength, elongation, impact and fatigue resistance. X-Ray examinations will prove the evenness of weld metal and absence of included gases and slag.

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STAINLESS . . .

Your PAGE Distributor offers you a complete range of electrodes for welding Stainless Steel. The uniform coating on PAGE-Allegheny STAINLESS STEEL ELECTRODES is heavy enough to shield against oxidation—to provide the protection of easily-removed slag (permitting longer cooling time)—to eliminate surface checking and to hold spatter loss to a minimum.

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ELLSTROMS THANK YOU... Mr. GRANSTEDT

3117 Lincoln Avenue San Diego, California November 26, 1943

Mr. Elmer Ellstrom c/o Dearborn Gage Company 22038 Beech Street Dearborn, Michigan

Dear Mr. Ellstrom:

It was with great interest that
I read your company's ad in the
November issue of the "Aviation"
magazine about your father, Hjalmar
magazine about your father, each background of
Ellstrom, and the real background of
the famous Swedish gage blocks. the famous Swedish gage blocks.

Through my own father I heard a Through my own father I heard a lot about your Dad's and Abrahams—lot about your before C. E. Johansson stepped son's primer work on the gage blocks long before C. E. Johansson It in and took hold of this great and in and took hold of invention. It is in and to important take any credit worldwide important take any creat not my intention to take any great away from Johansson and his famous away from Johansson with the famous away from gonnection with the famous gage blocks. But I am very glad to work in connection were glad to gage to, after many years of telling able to, after many years in toolrooms able to, after many work, to have somefriends and co-workers in have somefriends and co-workers to have something in print to back up my statement. ment.

G. C. Granstedt Gustav C. Granstedt





Raiph Elistrom





Olof Elistrom-



HIS unsolicited letter from Gustav C. Granstedt brings to light the part that Hjalmar Ellstrom played in pioneering the gage block. Because he never came to America to exploit his discovery his name was not known here until his son Elmer and grandsons Ralph, Elmer and Olof started the Dearborn Gage Co. in 1937.

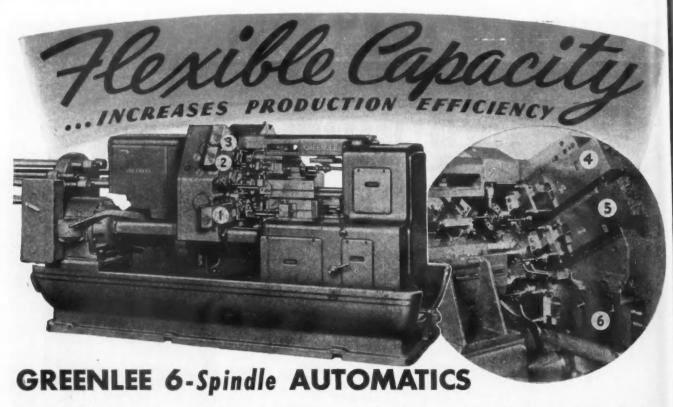
Today, Ellstrom Chromium Plated Gage Blocks are recognized by industry throughout the world for their longer wearing qualities and fine accuracies.



COMPANY • 22037 Beech Street • Dearborn, Michigan

riginators of Chromium Plated Gage Blocks

TES



CROSS-SLIDE OPERATIONS	POS. NO. 1	POS. NO. 2	POS. NO. 3	POS. NO. 4	POS. NO. 5	POS.
Forming	V	V	V	V	V	V+
Form Turning	V	V	V	V	V	VI
Shaving	V	V	V	V	V	Vt
Skiving	V .	V	V	V	V	VI
Stenciling	V	V	V	V	V	1
Knurling	V	V	V	V	V	1
Wide Form Knurling	V	V	V	V	V	V+
Facing	1	V	V	V	V	VI
Burnishing	1.	V	V	V	V	VI
Thread Rolling	V	V	V	V	V	VI
Under Cutting			V	V		
*Cut-Off	V	1	V	V	V	1
END-WORKING OPERATIONS						
Threading			V	1	1	1
Tapping			V	V	V	V
Reaming			V	V	1	V
Drilling	Any	Posi	tion	Except	Cut	-Off
High-Speed Drilling	16	29	10	98	**	25.
Boring	13	19		99	25	88
Eccentric Boring	.00	11	**		11	10
Facing	70	34	**	70.	27	10
Burnishing		15.	**	10		99.
Recessing	**	**	10	95	20	11
Chamfering	**	11.	78	14	20	12
Milling	311	44	115	26	99	. 20
Roller Turning	0.0	10	22			9.0

- † Only when not used as cut-off position.
- Cut-off cannot be combined with another operation on the same cross slide. Position may be varied to produce two or more parts simultaneously.

 With a minimum of down-time, hundreds of Greenlee 6-Spindle Automatics are today busy turning out millions of screw machine parts for the United Nations. An important factor termed "flexible capacity" is largely responsible for their high efficiency on a wide range of jobs, large or small. The flexibility of the Greenlee Six, for instance, makes possible fast alterations in set-ups and quick changes in tooling adjustments. Its capacity handles a wide range of operations. This is a vital factor today in meeting the everchanging requirements of war...will be more important tomorrow in dealing with post-war economy.

The flexible capacity of the Greenlee 6 handles with ease all of the 23 operations shown at left at any of the spindle positions

indicated. Thus, the sequence of operations are more easily arranged and synchronized to provide a high rate of efficiency on a wide variety of jobs.

Write for more information—get complete details on the flexible capacity of Greenlee 6 Spindle Automatics.

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ARE MIDGETS IN SIZE AND WEIGHT BUT THEY DELIVER AIR LIKE GIANTS

Advantages of mechanical propulsion for heat exchange and air circulation are available to a large number of operations where space and weight limitations rule out the use of centrifugal blowers. Dynamic Air Axial Flow Fans, with blade diameters as small as 4%" and total weights beginning at 5 lbs., are moving air successfully and economically in aviation, marine and industrial installations. The horsepower input is surprisingly low, and they operate against blower capacity pressures

Standard units of Dynamic Air Fans are easily adapted to the special demands of particular problems. Shells and inlet or outlet ends can be modified. In the small, 2-stage unit below, designed for double duty in conjunction with gasoline combustion heaters, note the scoop take-off through which forced draft is supplied to the heat combustion chamber, while the recirculation air is carried through the heater.

If you build planes or ships, or can use high efficiency air recirculation, we shall be glad to submit data and recommendations for you. We have designed and built axial flow fans for 11 years, and your special problem is our special business.



Unit above, 586-B, is a single stage aviation fan used on army aircraft. Equipped with radio filter condenser. Diameter is 6", weight 5.7 lbs., and 27.5 volt motor delivers 510 C.F.M. at 2" S.P. (695 C.F.M. free air). Can be modified for marine use, Other diameters up to 12".



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DIAMETERS: BLADE 45%"-SHELL 434"-INTAKE 534"

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MOTORS WOUND FOR ANY VOLTAGE

2 SETS OF BLADES

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cranking. Under the constant pressure of this great struggle, Exides are proving their durability, long-life and ease of maintenance.

Write for a FREE copy of the Exide catalogue on Heavy-Duty Batteries, it tells you what to order, how to order, and how to get the most from your Exide Heavy-Duty Batteries.



THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32

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▶ There's no waiting required for the Sulfamate Lead Process. No WPB restrictions, no priorities, no allocations, no license agreements. Materials are readily available. Regular equipment can be used. Prompt technical assistance can be supplied.

Lead plating is a growing method of improving corrosion resistance under many conditions. Sulfamate Lead Plating is a process developed by Du Pont to speed up and simplify lead plating. The Sulfamate Lead bath is easily made up and maintained with prepared salts. The solution yields smooth, dense, relatively pore-free coatings at 100% current efficiency!

Consult us now on how the Du Pont Sulfamate Lead Plating process can be installed quickly and easily. Our technical. staff will work with you in adapting the process to your facilities and requirements. For complete details, write, phone or wire today to: E. I. du Pont de Nemours & Co. (Inc.), Electroplating Division, Wilmington 98, Delaware.



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Can Brake Shoe's Research Group help with YOUR Punished Part PROBLEM?



Every machine has at least one part that takes a special beating. Repeat sales often depend on the wear life of this "punished part."

One of the many activities of Brake Shoe's Research Group is to analyze all the kinds of wear that shorten the life of such parts—corrosion, heat, erosion, impact, abrasion—and to find practical ways to increase wear resistance.

The answer may lie in a new alloy. It may lie in different heat treatment. Or in an entirely different material. It may be a combination of factors.

Where success is achieved, it means for the customer a better product — and for Brake Shoe a new customer.

The resources of Brake Shoe's Research Group, recently enlarged by the addition of an Experimental Foundry, are available to manufacturers whose production calls for large runs of standardized parts.

Consider Brake Shoe As a Source for Postwar Parts in Volume

When it is time to solve your "punished part" problem, remember Brake Shoe may have a contribution to make. You are invited to write to R. B. Parker, American Brake Shoe Company, 230 Park Avenue, New York 17, New York.



A parts source that may help you meet postwar competition

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 Built by Sterling Motor Truck Co., Inc.

"Takes a beating!"

Every part of this truck takes a beating when it goes over rough roads and the load shifts to the down side. The bearings are no exception, for the heavier the load the greater the strain on moving parts—the greater the need for rugged, dependable bearings like the ECF's on this truck. With every ECF comes a long life of day-long, year-long performance—of keeping rotating parts functioning smoothly and of transforming miles into minutes in the construction of North Atlantic army air bases. Wherever there's an ECF, there's a bearing job being done right.

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May 1, 1944

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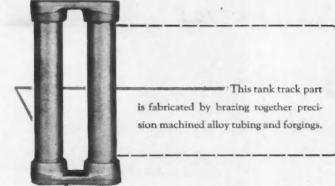
Proferall* Cast Crankshafts have a record of successful use over a period of the past ten years in engines of all sizes in every field-automotive, industrial, railway and marine.

C.W.C. engineers and metallurgists are ready to consult with any interested executive. Write C.W.C. for complete information about Proferall* Cast Crankshafts.

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Illustration:



Hydrogen Copper Brazed, cooled, reheated and quenched by Burgess-Norton in one continuous furnace operation.

of the completeness of Burgess-Norton's facilities for postwar production of precision parts which will be available to manufacturers when Victory Day draws nearer.



Precision Finishing as performed by Burgess-Norton is exemplified by 'the production of piston pins with finishes as fine as 2 micro inches.

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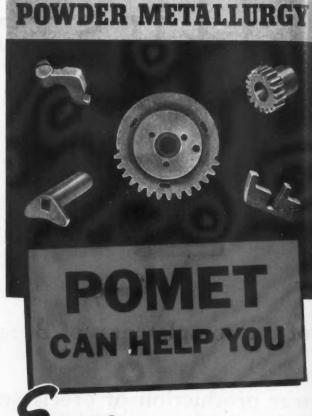
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Save on small parts for planes and cars

Pomet Powder Metallurgy offers automotive and aviation manufacturers a new source for parts that will eliminate production line bottlenecks, save material, man hours and money.

Parts in Seconds instead of Minutes

One quick stroke of the press and the part is practically complete—except for sintering—sometimes coining. While Pomet methods cut corners, they give you a good product—high density or controlled porosity, hardness, tensile and impact strength, ductility or other qualities to order.

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Precision manufacturing has always been a Pomet specialty. Many parts are produced with tolerances of plus or minus .001" or even closer. All or most of the usual expensive machining is being eliminated. Often Pomet Powder Metalurgy is your answer for the production of precise, complicated small parts.

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The Pomet plant was one of the first to begin volume production in the powder metallurgy field. Now, with added facilities, and a rich background of experience we can serve you better than ever before. We shall be glad to quote on blueprints and specifications. Send for literature.

Don't decide until you see what Pomet can do

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A SUBSIDIARY OF GENERAL BRONZE CORPORATION

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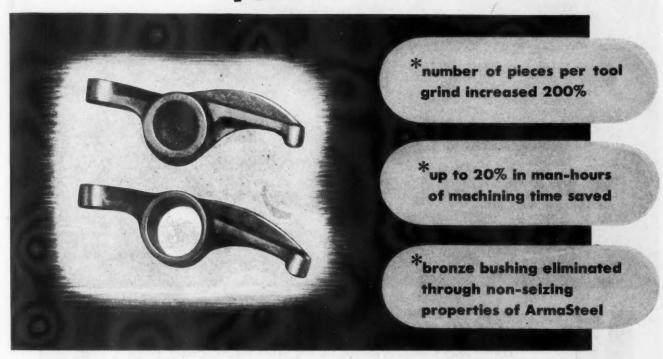
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FROM POWDER



TO PARTS

Look what ArmaSteel* accomplished in rocker arm production



Characteristics of ArmaSteel

Strength comparable to 1035-1050 steel. Any specified yield strength up to 90,000 lb. per sq. in. consistently obtainable.

Selective hardening by localized heating and water- or oil-quenching results in minimum surface hardness of 50 Rockwell C. (Tips of rocker arms are hardened in lead pots installed in production line, thereby eliminating extra trip to heat-treating department and back.)

Jominy hardenability tests show Arma-Steel comparable to low-alloy steels. The results obtained in rocker arm production are typical of how ArmaSteel is improving production of various products in many different industries. Here are some of the reasons why ArmaSteel is "doing the job" better, cheaper, faster: High resistance to fatigue and wear. Wide range of physical properties, accurately controlled to suit specific requirements. High hardenability rating. Machines to surface smoothness; polishes to mirror finish. Great rigidity. Metal so distributed as to give maximum strength and minimum weight. Less metal to be machined reduces chips, extends tool life, reduces costs.

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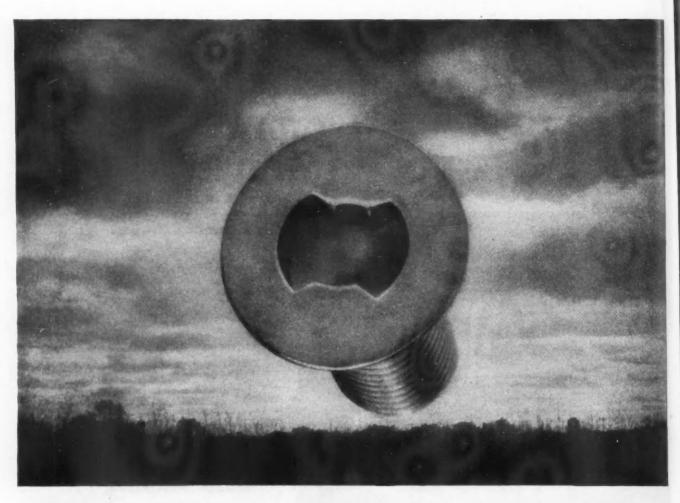
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New Horizons in assembly line production have been brought into focus by the advent of

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CLUTCH HEAD Screws . . . opening the way to new degrees of speed, safety, simplicity, and economy.

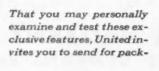
What other screw invites operator confidence and speed with a recess bull's-eye target so wide and so easy to hit?

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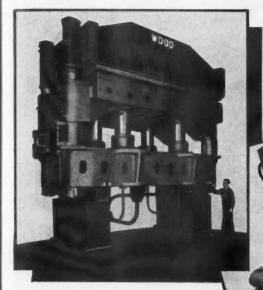
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OF EVERY TYPE!



(Above) 800 Ton Wall Board Press with Platen Size of 9'1" x 13'10".



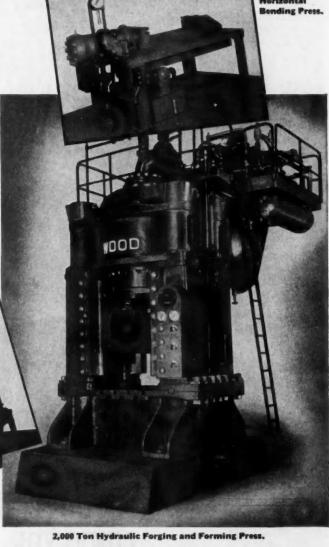
(Above) Double-ended Pipe Bending Press of 62½—125 Ton Capacity.



Joggling Press of 350 Ton Capacity.



(Above) 125 Ton Carbon Electrode Stub Press.



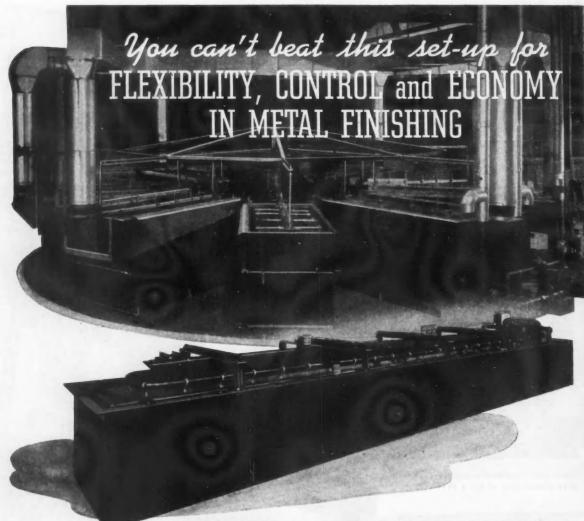
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The presses shown on this page are but a few of the many types which we manufacture. Whether your requirements call for forging, flanging or forcing...bending, joggling, molding or straightening... Wood engineers can help you solve your press problems.

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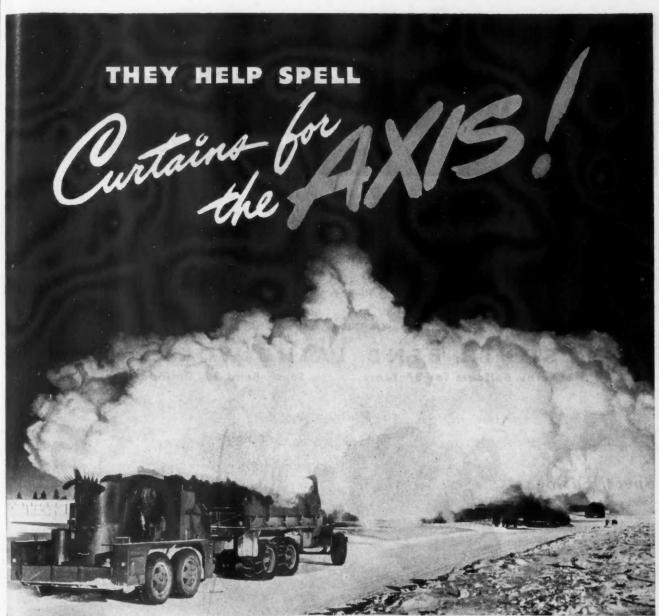
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THE SPERRY EXACTOR HYDRAULIC REMOTE CONTROL

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And that's not all! This electrode is available in all three popular aircraft

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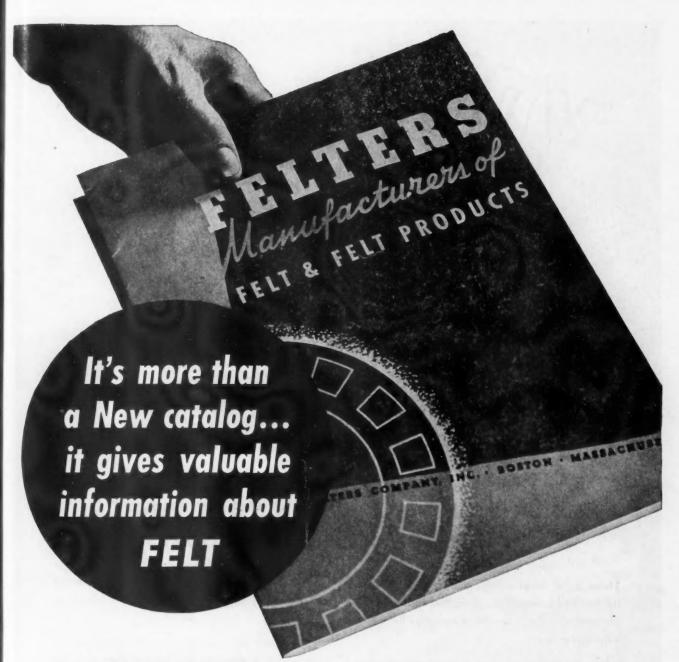
Used separately to supply horsepower or with a generator to furnish electric energy, the Andover Auxiliary Power Unit is so compactly designed and lightweight that its energy output is many times greater per pound of weight than has been available to industries heretofore.

The booklet, "Andover Auxiliary Power", gives complete information on this unit . . . its vital role in war today, technical engineering data and ways it can serve you in postwar. Write for your copy today, no obligation.



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WHEN YOU CHECK UP ON YOUR PLANT'S PAY-ROLL SAVINGS PLAN FIGURES!

These days, things change with astonishing speed. The Pay-Roll Savings Plan set-up that appeared to be an outstanding job a short time ago, may be less than satisfactory today.

How about checking up on the situation in your plant? Checking up to see if everybody is playing his, or her, part to the full measure of his, or her, ability. Checking up to see if 'multiple-salary-families' are setting correspondingly multiple-savings records.

A number of other groups may need attention. For example, workers who have come in since your plant's last concerted bond effort. Or, those who have been advanced in position and pay, but who may not have advanced their bond buying accordingly. Or even

those few who have never taken part in the plan at all. A little planned selling may step contributions up materially.

But your job isn't finished, even when you've jacked participation in your Pay-Roll Savings Plan up to the very top. You've still got a job before you—and a big one! It's the task of educating your workers to the necessity of not only buying bonds, but of holding them. Of teaching your people that a bond sold before full maturity is a bond robbed of its chance to return its full value to its owner—or to his country!

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War Bonds To Have And To Hold!

LET'S ALL BACK THE ATTACK-WITH WAR BONDS!

The Treasury Department acknowledges with appreciation the publication of this message

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The tough, resilient, coiled rawhide faces of C/R Hammers and Mallets strike effective blows without battering or marring...protects finished surfaces, machines delicate insular surfaces, machines delicate insular surfaces.

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C/R Hammers have permanent malleable iron heads which take replaceable insert faces of coiled mechanical rawhide.



Reconversion— A Physical Problem

(Continued from page 17)

ance to do it, we couldn't afford to do the same thing with the Government machines as we did with our own, because some property officer would come along and say:

"According to this contract you were going to take these machines and take care of them, reasonable wear and tear excepted, and here you have put them in a field and they are deteriorating." There would likely be a charge against us.

When we went into the war business we were eventually able to convert about 87 per cent of our machines to war work. Those stored outside were special-purpose machines that weren't readily adaptable to war work. We have looked over the Government machinery we have in our own and Defense Plant Corp. plants, and of the 20,903 machines, we see where we could make immediate peacetime use, if we could get possession of and title to them, of possibly 2000 machines.

I should think that a great many of the other machines would have to be scrapped. As an illustration, the long lathes that we use for making Bofors guns are very special-purpose lathes. There was nothing of that sort in existence when the war came on. They had to be built for the purpose of making, boring out and rifling the gun barrels. I can't imagine that there is going to be any use for special-purpose lathes of that kind after the war that will begin to take up the number which will become available when we and others discontinue the manufacture of these large cannon.

We made an estimate recently of the weight, just the sheer weight, of raw material in Chrysler Corp. plants. We estimated that there is about 75,000 tons of it and the amount of it that would be adaptable to the making of automobiles is negligible. I think it will be quite a shock to many people to find out how little some of this special-purpose machinery and some of the special materials that are around the country today are going to be worth for civilian use in the immediate postwar period.

To date we have been unable to find out whether the Government really wants to sell this machinery or not, and at what price they would be disposed to sell it. There is some regulation out that requires that when a representative of the Services authorizes the sale of a piece of Government equipment, he has to sign a certificate that the war effort will not be impeded and may be helped by this sale. That is a pretty big commitment for anybody to sign. The result is that there is very little business of that kind being done. We haven't been able to make any arrangements ourselves to assure that we can get certain items of Government equipment that we know

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Hardened for the Tough Grind



Pilots, today, go through a hardening-up process before being turned loose to grind out dangerous bombing missions. The delicate metal parts in a plane are worked up in much the same manner.

Take this accurate little shaft that Ace turns out by the thousands. The worm-threads and diameters are first rough-ground. Next, it goes through a nitriding process to give its surfaces extreme hardness. Then the worm and diameters are finish-ground to very close tolerances, maintaining concentricity and extreme surface hardness.

Here, under one roof, Ace offers manufacturers today the most modern equipment and the engineering ingenuity to put it to practical use. If you have need for small parts and assemblies calling for stamping, machining, heat-treating, or grinding, it will pay you to consult us. Send blueprints, samples, or sketches for quotation.



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The Ace battery of modern centerless grinders offers economies in the production of straight pins, tapered pins, and small-shouldered parts. Equipped to accommodate bar-stock or tubing up to 20' lengths and diameters from .030" to 6". Capacity available for your needs today.



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The Jenkins Capless Tire Valve is scientifically engineered to meet this vital need of millions. A simple, plugtype seat unfailingly seals air in the tube . . . without a cap. It has no removable core to work loose and let air escape. And it is a truly flexible valve . . . it has no long rubber-coated metal shank to rip the tube in case of a flat.

There's no gamble about the radically different Jenkins Tire Valve. It has been proved in actual service on millions of tubes, and has won the unstinted praise of tire and automotive engineers, service experts and car owners.

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GUARANTEED! Every Jenkins Capless Tire Valve is guaranteed Air-Tight tects tube in case of the life of the tube to which it is originally attached. through rim hole.

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1. Non-removable Valve Head...no cap to lose. 2. Standard Size Tip... all types of air chucks, threaded or not, will fit it. 3. Short Brass Insert protects spring and plug...does not impair flexibility. 4. Stainless Steel Spring resists corrosion... insures permanent seal. 5. Nickel Plated Plug. Smooth, rust-proof, self-cleaning. 6. Rubber Seat insures positive seal with plug. 7. Truly Flexible Stem protects tube in case of a flat by receding through rim hole.



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This book makes generally available for the first time a complete system of analytic techniques developed at North American Aviation, Inc., and already found highly successful as the basis for the engineering, lofting and tooling of aircraft.

These techniques are equally valuable for preliminary design and for the establishment of specifications for actual production. Highly precise, they eliminate production discrepancies and other inconsistencies heretofore existent in aircraft manufacture, and are especially successful in the streamlining of aircraft to meet widely varying conditions.

With a unique set of tables for great economy of time and effort

By special permission of the Monroe Calculating Machine Co., a \$6 set of 8-place tables of all natural and trig, functions, with interpolation to 10 places, is included in this book.

This book will help you solve many design and production problems. Get your copies today.

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we will want when we get back into peacetime operation.

The important thing when the war is over is going to be to get this Government material and this Government equipment out of our plants and to have settlements made that are final. The liabilities imposed on the part of the industry, compared with its capital and resources, are such that uncertainties along that line are going to be very troublesome indeed. I can illustrate in the case of the Chrysler Corp. Today we have about \$150 million of inventory, raw material and work-inprocess on war orders in our plants. We have a contingent purchase liability for supplies for which we have contracted and materials to carry on our war work of about \$500 million. Chrysler corporation's capital, its entire net worth, is only \$177 million. So, notwithstanding the fact that we consider ourselves well-financed to meet the ordinary problems of business, when it comes to disassociating ourselves with war business that has within \$30 million of our total capital tied up in inventory alone, and a liquidation of a \$500 million purchase commitment liability besides, you can appreciate that it is a matter of considerable concern.

This article by Mr. Hutchinson comprises excerpts from statements made March 28 by him before the House Committee on Postwar Economic Policy and Planning. Current developments for reconversion of the automobile industry to the manufacture of passenger cars will be found in the article on page 52 of this issue. It presents the outcome of the meeting of representatives of the passenger car companies and War Production Board on April 17 in Washington, during which various phases of the reconversion problem were discussed by them.

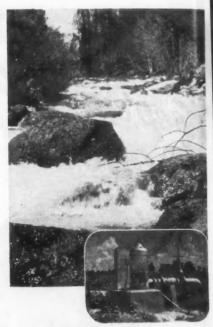
M.E.W.A. Regional Conference in New York

(Continued from page 29)

sented by B. F. Stevens of Van-Auken-Ragland, Inc., who stated that the importance of the automotive wholesaler in the war and post-war periods would be emphasized in the advertisements.

Attendance at the New York Regional Conference exceeded that of the previous year as did the number of manufacturers represented. At the New York Conference 133 manufacturers had booths, an increase of 55 over 1943. At the Chicago Conference 177 manufacturers are planning to have booths, while only 80 used booths last year. At the 1944 New York Conference 30 manufacturers were unable to get accommodations, while 20 were unable to obtain booths at the Chicago Conference.

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WATER WILL BE AN URGENT POSTWAR NEED

Maybe it is entirely too early to order your postwar Water System. Maybe you can't even determine the amount of water you may need. But you do know that you are going to be pretty "hard boiled" about such things as long-life quality—top flight efficiency—and extra low operation cost.

Summing it up, you are going to demand the very features that have made Layne Water Systems world famous. But you are not going to buy on reputation alone. You are going to ask for a lot of bed-rock facts and figures. You will want to know exactly what you are getting for your dollars.

Fortunately, you are going to be the very kind of prospect that Layne likes to meet—the kind of buyer that will understand and fully appreciate the incomparably fine features found only in Layne Turbine Pumps and Water Systems. You are going to be a dandy postwar customer, and like hundreds of other "look before you leap" buyers, you are going to be a 100 percent satisfied Layne customer.

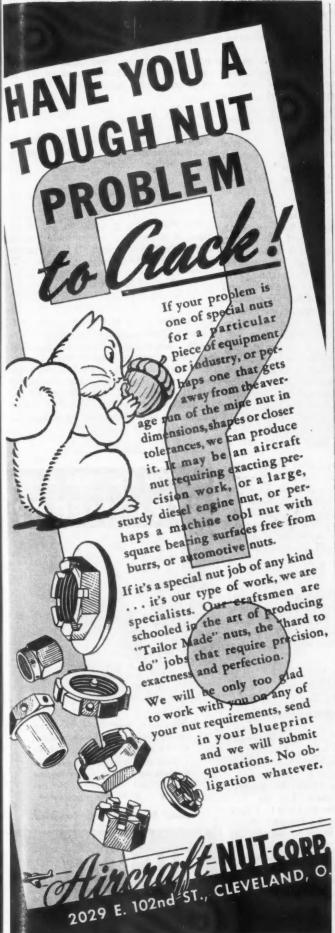
For literature and further facts, address Layne & Bowler, Inc., General Offices, Memphis (8), Tenn.

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BUILDERS OF WELL WATER SYSTEMS



SPEED PRECISION
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Send for this



With Wet-Belt Surfacing solid areas, flanges, bosses, interrupted sections, can be surfaced with one application to the belt—freehand or with simple jigs—eliminating the distortion that often results from clamping. Effective coolants do away with frictional heat, distortion, cracking, discoloring, flow.

Wet-Belt Surfacing is faster—5 to 25 times faster—than previous methods. Enthusiastic shop men report notable savings in time, in fewer rejects, in increased output. And not the least of these savings is the fact that Wet-Belt Surfacing, from the start, permits semi-skilled operators to turn out close-limit work, thus releasing skilled men for other operations.

Porter-Cable Wet-Belt Surfacers everywhere are cutting production schedules, simplifying operations, reducing investment in machines, jigs, fixtures, and turning out the work faster, at less cost, and WITH SUPERIOR FINISH. Get the facts! Send today for our new booklet!

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than 23 years, the Mercury Mark has stood for precision and skill in craftsmanship, plus a sixth sense which can be acquired only through experience ... the know how to do a job right . . .

> aluminum fuel and oil tanks · ailerons, fins, rudders and similar surfaces • aircraft parts and accessories.



Flash Weld Proof-Loaders

(Continued from page 35)

The pressure reading, as well as the psi. proper position of the air jack, may is 52,500 psi. The moment of inertia be determined from a table of load set- of a tube cross section is tings for the particular tube to be

The air jack is moved to its proper position and the air valve is turned to the "on" position. The tube is revolved through two revolutions, and the air pressure is turned off. The tube is removed from the chuck and the procedure is repeated for the other end of the tube.

On %-in. tubing, of a total of 20,000 welds tested, only 50, or 0.25 per cent, failed. On %-in. and 1-in. tubing, of a total of 10,000 welds tested, only 3, or 0.03 per cent, failed. The figures were obtained directly from the operators of the proof-loading machines, and must be considered to be approximations, as no written records were kept. The values given are believed to be conservative estimates in all cases.

The failures reported for %-in. tubing seem to occur in batches rather than indiscriminately. For example, no failures occurred in the proof-loading of the last 6000 welds, whereas previous to that time, several failures noted in a batch of 20 pieces. This points to the possibility of some maladjustment of the flash welder, which was then corrected.

It is apparent that since the percentage of failures occurring is very small, the resistance welds possess excellent strength characteristics. It is necessary, however, to proof-load the welds, to eliminate the very few which are defective, and this is adequately accomplished by the two proof loaders in use.

Appendix

Calculation of the required bending moments for the various sizes of tubing is based on the following formula, which can be found in any standard reference book on the strength of ma-

$$M \,=\, \frac{s\;I}{e},\; \ldots \ldots \ldots (1)$$

where M is the bending moment to be applied, lb-in.;

s, the unit stress in the outermost fibre, psi;

I, the area moment of inertia of the section, in.4;

c, the distance from the neutral axis to the outermost fibre, in.

The stress s is already known, I may be calculated, and c is known; therefore, the equation may be solved for the desired bending moment. To illustrate the method, the following numerical example is given:

A 1-in. by 0.058-in. flash-welded tube of X4130 steel is to be proof-loaded to a stress equal to 75 per cent of the yield stress of the parent metal. The yield stress of X1430 steel is given as 75,000

Seventy-five per cent of 75,000

$$I = \frac{\pi}{64} (D_1^4 - D_2^4)$$

where D1 is the outside, and D2 the inside diameter of the tube, both in inches. Substituting.

$$I = \frac{\pi}{64} (1^4 - 0.884^4) = 0.0191 \text{ in}^4$$

The distance c in equation (1) in the case of a tube is the outside radius, and in the present example it is equal to 0.5 in. Therefore, solving for M,

$$M = \frac{s I}{c} = \frac{52,500 \times 0.0191}{0.5} = 2000 \text{ lb-in.}$$

For other sizes of tubing and for different materials similar calculations are made. Many combinations of loads and lever-arm lengths may be used to give the desired bending moment. In making up the "Tables of Load Settings," attention was paid to the length of rod available, and the number of different lengths of lever arm was held down to

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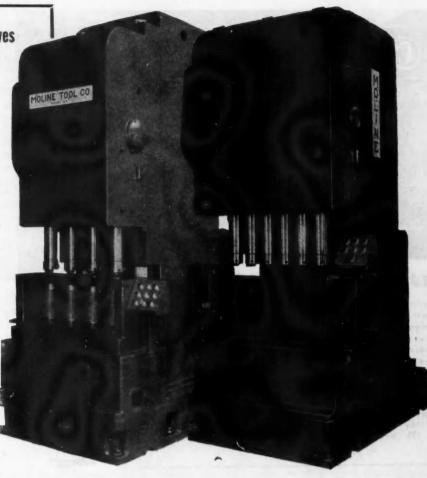
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General Plan of **General Motors** for Reconversion

(Continued from page 23)

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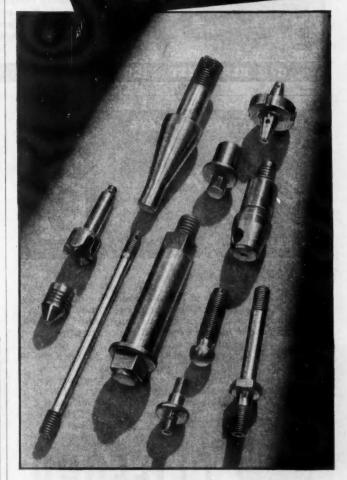
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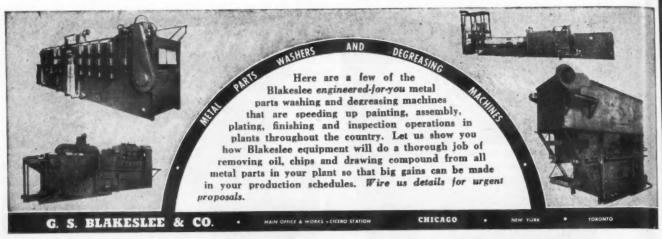


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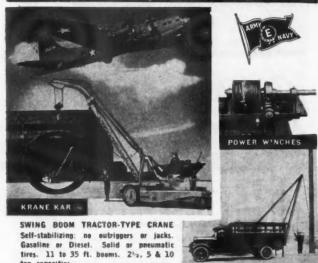
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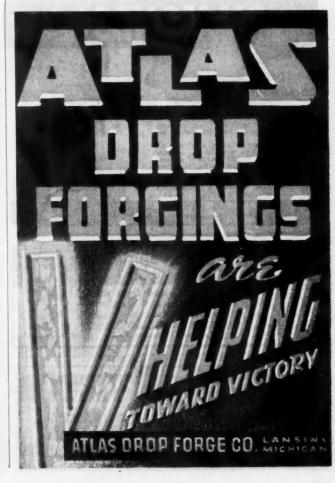


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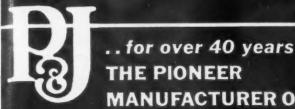
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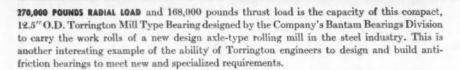
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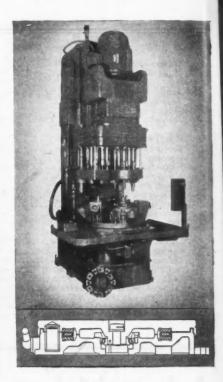
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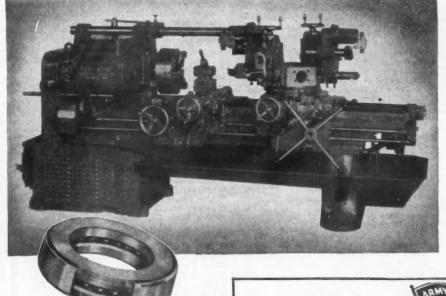
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WITH TORRINGTON BEARINGS





MULTIPLE STATION DRILL PRESS, built by Snyder Tool & Engineering Company, uses large Torrington Roller Thrust Bearings to provide anti-friction operation for the rotary table and insure sturdy support to the "work." Bearing, as shown in cross-section, is supplied in three sizes to meet the requirements for both hand and power indexed tables.



FOR ANTI-FRICTION OPERATION on the long and cross feed shafts of this Universal "Cincinnati Acme" Turret Lathe, built by The Acme Machine Tool Company, four Torrington banded Ball Thrust Bearings are employed in each apron. This type of Ball Thrust Bearing as shown in inset is supplied by Torrington's Bantam Bearings Division in a standard range of sizes from ½" to 3½" I.D.



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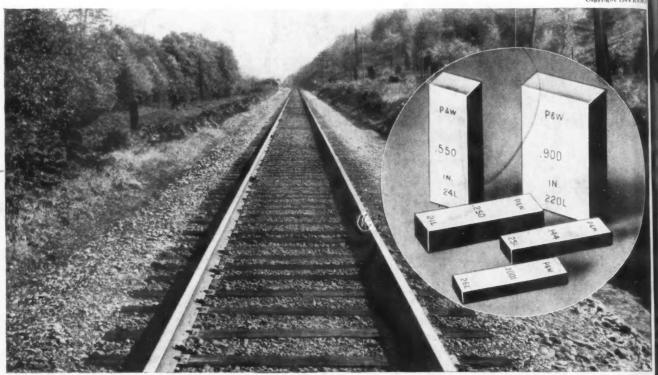
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